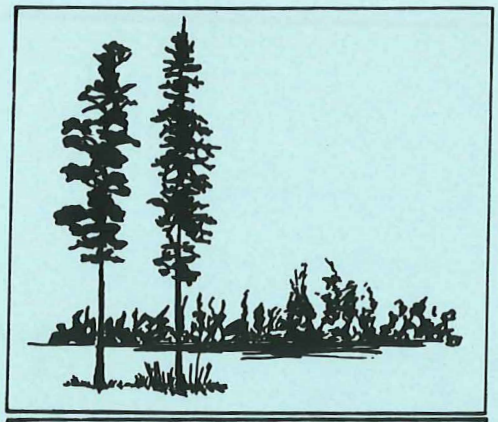

FOREST PEST CONDITIONS IN WISCONSIN

ANNUAL REPORT

1990

DEPARTMENT OF NATURAL RESOURCES
BOX 7921
MADISON, WISCONSIN 53707

FOREST PEST CONDITIONS IN WISCONSIN ANNUAL REPORT - 1990

Compiled and Edited by Allen J. Prey, David J. Hall, and Jane Cummings Carlson

DEPARTMENT OF NATURAL RESOURCES
Division of Resource Management
Bureau of Forestry

ACKNOWLEDGEMENTS

This record of the activities of forest pests and other destructive agents of growing trees in Wisconsin's forest nurseries, plantations, and natural timber areas was made possible by the dedicated work of pest management personnel in each district and at the Forest Pest Management Laboratory in Madison. Department of Natural Resources foresters, other Department field personnel, cooperators in other public agencies and private forest industry contributed valuable assistance in monitoring the forest lands in all classes of forest ownership.

There was a personnel change in the Forest Pest Management program in Wisconsin in 1990. Steve Katovich, Western District Forest Entomologist stationed at Eau Claire, Wisconsin, left state service for a position as Forest Entomologist with U.S.D.A. Forest Service, State and Private Forestry, St. Paul, Minnesota, on July 15, 1990.

Preparation of this Annual Report was a result of a team effort involving Steve Katovich, William Kearby, and Shane Weber, DNR District Entomologists who submitted district reports. Jane Cummings Carlson and Dave Hall, Forest Pest Unit, Madison, consolidated the district reports and wrote the final draft using personal computers. Mark Guthmiller, Limited Term Employee, prepared the computer-generated and hand-drawn maps, and Katherine Severson, Southern District Program Services, completed the word processing. Final printing was done by the DNR Bureau of Program Services.

Allen J. Prey
Supervisor, Forest Pest Management
June 18, 1991

TABLE OF CONTENTS

PAGE NO.

Forest Pest Management Personnel v

INTRODUCTION vi

ASH 1
- Ash Yellows 1

ASPEN 3
- Aspen Bronzing 3
- Aspen Blotchminer 3
- Forest Tent Caterpillar 4
- Forecast for 1991 5
- Pattern of the Outbreak since 1986 in Northcentral and Northeastern Wisconsin 6
- Phenological Notes 6
- Large Aspen Tortrix 7

BASSWOOD 8
- Introduced Basswood Thrips 8

BALSAM FIR 9
- Balsam Fir Sawfly 9
- Spruce Budworm 9
- Balsam Gall Midge 9
- Balsam Twig Aphid 9
- Balsam Fir Christmas Trees 9

BIRCH 10
- Birch Leafminer 10
- Bronze Birch Borer 10
- Yellow Birch Dieback 10

BUTTERNUT 11
- Butternut Canker 11

CHERRY 12
Eastern Tent Caterpillar 12

CHESTNUT 13
Chestnut Blight 13

CHRISTMAS TREES 14
Cyclaneusma Needlecast 14
Pales Weevil 14
Diplodia Shoot Blight and Canker 14
Cytospora Canker 14
Spruce Needlecast 14
Red Pine Shoot Blight 14

LARCH 15
Larch Needlecast 15
Larch Sawfly 15

MAPLE 16
Pear Thrips 16
Sugar Maple Decline Surveys 16

NURSERY 17
White Pine 17
Diplodia Shoot Blight and Canker 17
Oak Seedling Mortality 17

OAK 19
Oak Wilt 19
Fall Cankerworm 22
Saddled Prominent 22
Twolined Chestnut Borer 22
Twig Dieback 22

PINE 23
Diplodia Canker and Shoot Blight 23
Scleroderris Canker 23

Red Pine Shoot Blight 24
Jack Pine Budworm 24
European Pine Sawfly 24
Redheaded Pine Sawfly 25
Red Pine Needle Midge 25
Red Pine Shoot Moth 25
Saratoga Spittlebug 25
Pine Tortoise Scale 25
Pine Root Collar Weevil 25
Pine Root Tip Weevil 26
White Pine Weevil 26
Pine Engraver 26
White Grubs 26
Plains Pocket Gopher 26
Meadow Vole 26

SPRUCE 27
Spruce Needle Rust 27
Yellowheaded Spruce Sawfly 27

BLACK WALNUT 28
Plantation Black Walnut Canker 28

MISCELLANEOUS SPECIES 29
Gypsy Moth 29
Periodical Cicada 30
Weather 32

APPENDIX A 33
Seed Orchard IPM Development Program 33

APPENDIX B 34
Lake States Pear Thrips and Introduced Basswood Thrips Survey 34

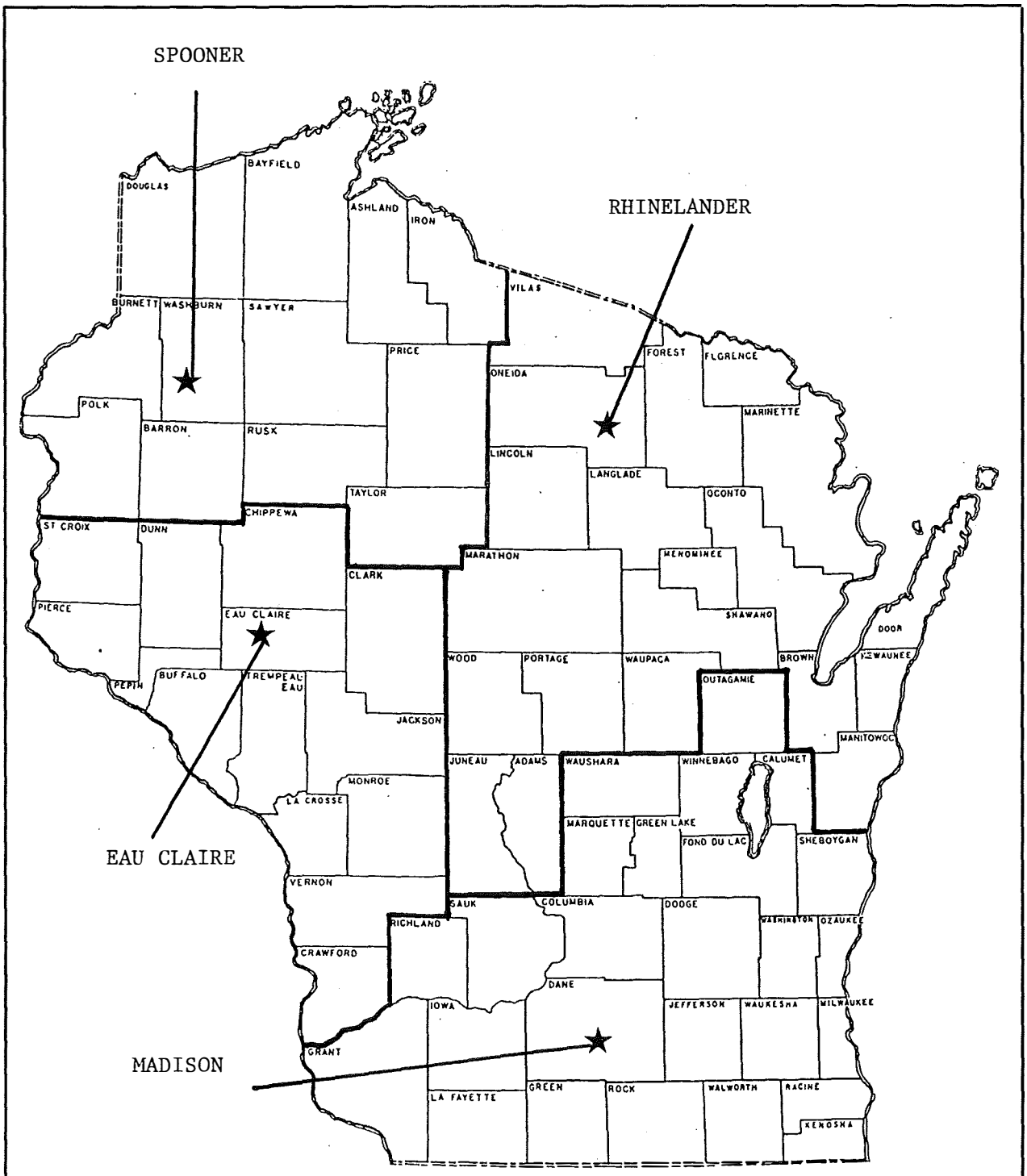

Figure 1. Station locations of Wisconsin Department of Natural Resources District Entomologists and Forest Pest Unit Personnel.

DEPARTMENT OF NATURAL RESOURCES
Forest Pest Management Personnel - December 31, 1989

Name	Title	Address	Telephone
Prey, Allen J.	Supervisor, Forest Pest Management	DNR, 3911 Fish Hatchery Road, Madison, WI 53711	(608) 275-3274
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Kearby William H.	Forest Entomologist	DNR, Box 818 107 Sutliff Avenue Rhinelander, WI 54501	(715) 369-8934
Katovich, Steven	Forest Entomologist	DNR, WD Headquarters 1300 W. Clairemont Ave. P.O. Box 4001 Eau Claire, WI 54702	(715) 839-4156
Weber, Shane D.	Forest Entomologist	DNR, Box 309 Spooner, WI 54801	(715) 635-2101

INTRODUCTION

This report lists the major insect and disease problems reported on forest land in Wisconsin in 1990. While the report does not list all the insect and disease problems that occurred on forest land, it does highlight major or noteworthy insect infestations and disease occurrences including abiotic damage to trees.

In 1990, insect and disease detection surveys were conducted on 6 million acres and evaluation surveys on another 4.5 million acres. In addition, Wisconsin DNR district entomologists and forest pest staff continued to teach integrated pest management principles to Wisconsin DNR foresters, industrial foresters, and private woodland owners. District forest entomologists and forest pest unit staff provided a wide variety of programs and information on forest pests in 1990. For example, a Wisconsin DNR chestnut blight control project appeared in the February 1990 issue of National Geographic. The article "Chestnuts - Making a Comeback" outlined the national status of chestnut that included information on using fire fighting foam in Wisconsin to prevent spore dispersal when removing infected trees. A photo of Terryl Buckman, DNR, applying the foam in May 1989, appeared in the magazine. Also, Jane Cummings Carlson met with the American Chestnut Foundation Board and toured the site in January, 1990. Jane lectured about chestnut blight to a botany class at UW-LaCrosse on May 7, 1990. Also, a survey of the chestnut blight situation in the vicinity of West Salem, Wisconsin was completed in May. This was a cooperative project between Jane and Dr. Jerry Davis (Botany Department, UW-LaCrosse).

The IPM program for Wisconsin Christmas Tree Producers got off to a good start in 1990. University of Wisconsin-Extension announced it was going to cooperate with the Wisconsin Christmas Tree Producers Association and Wisconsin DNR in developing an IPM Program in 1990-91. Bill Kearby, two LTEs, and Allen Prey (all from WDNR) staffed a diagnostic booth at the Wisconsin Christmas Tree Producers' summer meeting at Black River Falls on July 27, 1990. About 100 growers were helped with problems ranging from herbicide injury to needle rust on blue spruce. Rose Kachadoorian, UW-Extension IPM Program Coordinator, presented information on an UW-Extension Christmas Tree Pest Scouting Program planned for 1991. More service can now be provided to Christmas tree producers with fewer field visits. Jane Cummings Carlson provided information to the UW-Extension Christmas Tree Pest Information Phone (1-800-236-4264). When dialed, a computer-generated voice will reply with the latest Christmas tree pest information.

Dave Hall participated in a meeting concerning the control of white grubs with biological agents such as bacteria and nematodes at Michigan State University on January 31, 1990.

Allen Prey participated in a meeting concerning "The Potential Effects of Global Climate on Forests in the Lake States." The meeting was held in Madison on February 22, 1990. In attendance were representatives from the EPA, Wisconsin DNR, Minnesota DNR, and Dan Botkin from the University of California-Santa Barbara who demonstrated a computer model that showed the effect of global warming on Jack Pine-Kirkland Warbler sites in Michigan.

Dave Hall (WDNR) and Julie Nara, Wisconsin Department of Agriculture, Trade and Consumer Protection (WDATCP), gave talks on the status of gypsy moth at a Woodland Owners Conference in Milwaukee on February 3, 1990. Dave also participated in a WDATCP telephone press conference on gypsy moth on February 14, 1990. Dave updated a gypsy moth article to be published in the next of issue of WWOA's Woodland Management Magazine. He also attended a WWOA Education Committee meeting in Portage, Wisconsin on February 20, 1990. Dave also attended and staffed a pest management exhibit concerning gypsy moth and other forest pests at the University of Wisconsin-Extension and WDNR "Eastern Area Woodland Owners" meeting in Fond du Lac, Wisconsin on February 17, 1990.

Dave Hall and Jane Cummings Carlson revised the pest management guidelines for the DNR Silvicultural Handbook and submitted the finished manuscript for inclusion in the updated handbook issued December 5, 1990.

The entire WDNR pest management unit attended a statewide functional meeting February 6-8, 1990 at Cable, Wisconsin. An exhibit from the WDNR on gypsy moth and chestnut blight prompted much interest and many questions.

Jane Cummings Carlson trained approximately 70 people in IPM in forestry at a pesticide certification training session held in Stevens Point, Wisconsin on February 22, 1990.

Staff from the WDNR forest pest management unit participated in a USDA State and Private Forestry Forest Pest Cooperators Meeting at St. Paul, Minnesota on March 7 and 8, 1990. We discussed a wide variety of forest pest topics including Federal Forest Pest Focus Funding. The WDNR received the following FPM Focused Funds for Federal 89-90, ash yellows survey: $3,500; and thrips survey: $10,000. In addition, the WDNR will be receiving a $12,000 grant for ongoing seed orchard pest management work.

Dave Hall helped WDATCP prepare a proposal for a 1990 gypsy moth trapping and control program for emergency funding. WDATCP received $272,000 in emergency requests (s.s. 13.10) in 1990 to conduct intensive monitoring for gypsy moth and a control program at 9 sites totaling 530 acres in eastern Wisconsin.

Jane Cummings Carlson made a presentation on WDNR Pest Management and UW-Extension plans for an IPM Christmas Tree Program in Wisconsin at a meeting of Christmas tree growers in Wisconsin Rapids on March 1, 1990. Approximately 75 people attended the meeting sponsored by T. H. Agri-Chemicals, Inc. An article "Update on Cyclaneusma Needlecast: A New Threat to Scotch Pine Christmas Tree Plantations," by M. E. Ostry; J. H. Nichols, North Central For. Expt. Sta.; J. C. Carlson, Wisconsin DNR; and G. C. Adams, Mich. State Univ. appeared in the March 1990 Wisconsin Christmas Tree Producers Assoc. Quarterly Journal.

Jane Cummings Carlson chaired a session and staffed a forest pest exhibit at the Society of American Foresters' State Meeting at Oshkosh on March 13 and 14, 1990.

Steve Katovich DNR Western District entomologist presented a "Weed control for tree planting sites" talk at the winter meeting of the Chippewa Valley Chapter of WWOA. He also participated in the field day in Trempealeau County discussing white pine and oak pest concerns. Steve Katovich also produced a 30-minute video with Eau Claire County's UW-Extension agent on "Urban Tree Pest Concerns" for the local cable access TV station which was put on with the Northern Hardwood Pest Workshop for the LaCrosse area.

Bill Kearby, DNR North Central District entomologist, presented a report of insect and disease problems in the Lake Michigan District (WDNR) at the Marinette Area meeting during October, 1990. In addition, he participated in biodiversity training at Trout Lake and discussed insect and disease situations at the forestry staff meeting in Wausau, during October, 1990. In November of 1990, Bill Kearby presented a talk to the Arborist Society in Madison. Bill demonstrated the thin line and basal methods of herbicide application for Marathon County forestry personnel.

In March of 1990, Bill Kearby inspected the pesticide storage facilities at Langlade, Lakewood and Thunder River trout rearing stations (WDNR). He also reviewed and approved aerial and ground applications of herbicides for vegetation management on the Ackley, Buena Vista, Mead, and NHAL properties for the wildlife programs in 1990. In addition, Bill reviewed and made herbicide recommendations on county and private lands and updated pesticide files.

Bill Kearby participated in the following events: a pesticide update sponsored by Androc Chemical in Wausau; a Lyme Disease update sponsored by Marshfield Clinic; a district forestry staff meeting in Wausau; the Woodruff Area Forestry meeting at Nicolet College; he gave a presentation to 65 people at the Oneida County Woodland Owners Association on insects, diseases and herbicides; prepared three news releases for the public in the North Central and Lake Michigan Districts on white birch care, forest tent caterpillar, and the friendly fly; prepared an article for the Timberline summer issue on Saratoga spittlebug control and state law with Roy Jacobson; and gave six radio interviews and one television appearance.

Bill Kearby also gave a presentation to 260 people at the Marinette Woodland Owners Association on insects, disease, and drought at Crivitz. He participated in the pesticide training program for recertification in Forestry, in Stevens Point. In addition, he attended a public meeting on the proposed gypsy moth suppression program at Algoma and handled landowner questions on related other forest pests. He also participated in the State Cooperators Meeting in St. Paul, Minnesota. After all of this, he still found time to give a presentation to the Wisconsin County Forests Association administrators' spring conference in Rhinelander and prepare two news releases for landowners in northeastern Wisconsin on red pine cutting restrictions and oak wilt cutting policy.

Shane Weber, WDNR northwest district entomologist, presented information on the gypsy moth to the Spooner Kiwanis Club. He presented information on entomology and forestry in Wisconsin to fourth grade classes at Prairie Farm in Siren and Spooner. Shane also presented talks on bear ticks and Lyme disease to the Spooner Boy Scouts and Girl Scouts. Information on insect collecting was presented to the Spooner 4H Chapter. Shane Weber also presented a formal gypsy moth program to the Brule Area foresters at Cable. Shane Weber also hosted the DNR forest pest advisory council during their 1990 field tour. He also conducted a red pine planting field training session for state and county foresters in the Cumberland area. This field session was done in cooperation with John Borkenhagen, the WDNR Hayward Nursery Superintendent. Shane Weber also collected the first cone crop from the Sawyer Creek blister rust resistant seed orchard. The nurturing of this genetically disease-resistant seed has been entrusted to the capable hands of John Borkenhagen.

Jane Cummings Carlson was a co-author of "Wisconsin's Power Line Forest Fire Prevention Manual" that was distributed to DNR forester/rangers for fire prevention programs concerning utilities.

Allen Prey spent considerable time at the University of Wisconsin-Madison Department of Plant Pathology with the Search and Screen Committee interviewing forest pathologist candidates.

"Forest Herbicides for Weed Control in the Lake States" 1990 - Extension Bulletin E-2219, by D. O. Lantagne, R. Heyd and D. Hall, was published by Michigan State Univ." and distributed to foresters in the Lake States.

Global warming in relation to forest health in Wisconsin has been a concern of several WDNR administrators. Cheryl Rezabek and Allen Prey of WDNR have been working with the EPA and USFS on exploring possible cooperative projects. Cheryl, Jane Cummings Carlson, Bob Dumke and Allen Prey visited with scientists at the North Central Forest Experiment Station in St. Paul, Minnesota about cooperating on projects and also attended a seminar on "Possible Effects of Greenhouse Warming on Northern Hardwood Forests."

Jane Cummings Carlson and Steve Katovich conducted a Northern Hardwood Pest training session for DNR Foresters from the LaCrosse area at Sparta on May 9, 1990.

Jane Cummings Carlson and Allen Prey attended a Nursery Superintendents Meeting at Wisconsin Rapids on June 14, 1990. Jane presented information on the survival of oak seedlings grown at the three WDNR nurseries. Her outplanting trials confirmed that the decision not to ship ***Cylindrocarpon*** infected oak seedlings was correct.

A field tour for the WDNR Forest Pest Steering and Advisory Council in the Solon Springs-Gordon area on June 19, 1990 was organized by Allen Prey. Shane Weber and other Northwest District staff provided a varied and interesting tour of several insect and disease problems in northwest Wisconsin.

Jane Cummings Carlson and Allen Prey participated in a Mycological Society Meeting of America held at UW-Madison. They attended sessions on June 24 and 25, 1990, concerning a variety of topics including the application of specific ectomycorrhizal fungi in world forestry and entomopathogenic fungi as bio-insecticides.

Jane Cummings Carlson and Margaret Bemis were instructors at a National Career Workshop for 40 senior girl scouts on June 24, 1990 at the Central Wisconsin Environmental Center — UW-Stevens Point. The workshop was titled, "Caring for the Earth, Woodlands." Jane had an opportunity to use her training in sign language to teach a deaf girl scout.

Jane attended a "Natural Resources, Human Resources: Diversity for Success" planning meeting in St. Paul. The conference will be held in Stevens Point in 1991.

Dave Hall presented information on gypsy moth management to WDNR Lake Michigan District state park supervisors at Green Bay on July 25, 1990.

Jane Cummings Carlson attended the SAF National Meeting in Washington, DC on July 30 through August 1, 1990 and served as secretary of the Forest Pest Management Working Group.

Cheryl Rezabek, Jim Werlein, Allen Prey and two Air Management LTEs with WDNR participated in a North American Maple Decline Training and Certification session at Merrill on July 12, 1990. The instructors were with the U.S. Forest Service at Durham, New Hampshire. Also in attendance were trainees from USFS, S&PF, St. Paul, Minnesota and from Michigan State University.

Jane Cummings Carlson and Bill Kearby (WDNR) conducted an aerial survey for oak wilt in Marinette County on July 18, 1990. Two-lined chestnut borer activity in 1989 made identification of oak wilt sites difficult. Six oak wilt pockets with the Wisconsin-Michigan oak wilt control demonstration area were trenched in August.

Jane Cummings Carlson also examined Whitefish Dunes State Park for hazardous trees where conducted a hazardous tree training session for WDNR Lake Michigan District park managers on August 22, 1990.

Allen Prey participated in an International Union of Forestry Research (Diseases and Insects in Forest Nurseries) meeting in Victoria, British Columbia on August 22-29, 1990. Approximately 50 plant pathologists and entomologists from 12 different countries attended to discuss the latest research results and new nursery disease problems.

The WDNR forest pest management unit received diseased walnut seedlings for diagnosis from the Iowa State Forest Nursery at Ames, Iowa because Jane Cummings Carlson was Chair of the Protection Committee of the National Walnut Council.

The fuel oil tank at the forest pest laboratory was finally removed after a 3-year wait with no major problems.

Allen Prey and Dave Hall participated in a very interesting SAF Field Tour in Dane, Sauk and Richland counties on August 9, 1990 concerning consulting forestry, forest management and habitat classification.

Dave Hall attended a Forest Vegetation Management Field Tour on August 7 and 8, 1990, which was hosted by the University of Minnesota and Consolidated Papers, Inc. The Vegetation Management Co-op and Jim Benson (Consolidated Papers) are demonstrating the growth advantage due to various vegetation management scenarios.

On August 21, 1990, Dave Hall attended the WWOA Educational Meeting at Pardeeville. The Woodland Neighbor Program is making real progress. They also plan to increase WWOA activity in safety education for woodland owners.

Jane Cummings Carlson attended the American Phytopathological Society Meeting in Grand Rapids, Michigan. She presented a paper entitled, "Stem Canker of Plantation Black Walnut in Five Central States." She also presented a poster entitled, "Sugar Maple Habitat Classification as Part of a Hardwood Decline Survey in Wisconsin." Jane began her term as chair-elect of the Forest Pathology Committee for APS. She will be chair of the committee from September 1, 1991 to September 1, 1992. She was assigned to a committee to do a survey of universities on their undergraduate programs in forest biology.

Jane Cummings Carlson and Allen Prey investigated a whey spreading operation located near Arpin in Wood County, Wisconsin. Trees in a woodlot were dying downstream from the whey spreading area. Soil and foliage samples were collected for analysis of soluble salts.

Dave Hall participated in a statewide WWOA meeting in Rice Lake on September 22 and 23, 1990 and staffed an exhibit on gypsy moth. Dave mentioned that the field tour visited several oak logging jobs that were high graded to the displeasure of the local foresters.

Jane Cummings Carlson gave a presentation to the Wisconsin Seedling Growers Association on diseases of nursery stock at a meeting at Plainfield, Wisconsin in September. She also gave information on the services provided by DNR Forest Pest Management, and Karen Delahaut-Schneider presented information on plant and soils diagnostic services available at the University of Wisconsin-Madison. Nine private nursery owners attended.

Jane Cummings Carlson and Allen Prey attended the North Central Forest Pest Workshop in Brainerd, Minnesota, September 10-13, 1990. Jane gave a presentation on a North Central States Regional Survey of Canker in Black Walnut Plantations.

Jane Cummings Carlson worked with the superintendent at Governor Dodge State Park to evaluate hazardous trees and to determine the need for repeating training for parks employees in hazardous tree recognition.

Jane also worked with Campbell Tree and Land Company on a fumigation/ fungicide/herbicide plan for their tree nursery in Wautoma. Lynn Hummel, nursery superintendent at Wilson State Nursery, and Jane worked together to help Campbell decide on pest management strategies. They saved Campbell Tree and Land $10,000 by showing them that fumigation would be a waste of money, considering the condition of the land and the timing.

Allen Prey and Jane Cummings Carlson each had two-week appointments as Acting Chief of Protection and Reforestation Section, Bureau of Forestry, Madison, which was quite challenging, interesting and full of insight. The

experience was very helpful in emphasizing communication problems within WDNR's Bureau of Forestry.

A 1990 Wisconsin forest pest management situation report was prepared and distributed to all WDNR timberline recipients and to all interested forestry personnel in North America. Also, a 1990 Wisconsin forest pest conditions report was prepared and submitted to Forest Pest Management, Northeastern Area S&PF, St. Paul, Minnesota. Information in this report will be incorporated into a nationwide forest pest report.

Jane Cummings Carlson is cooperating with plant pathologists from Michigan State University, West Virginia University, and Cornell University to introduce a hypovirulent strain of the chestnut blight fungus into a 60-acre stand of American chestnut in LaCrosse County, Wisconsin. Jane is providing all the data on stand composition, disease incidence, and cultures of the disease for the cooperators. The fungus conversion from virulent to hypovirulent will be done by the Michigan State cooperator. The objectives are to slow the movement of the virulent form of the fungus and study the movement of hypovirulence in a stand that is at an early outbreak stage. The hypovirulence introduction is planned for August of 1991.

Jane Cummings Carlson, Dave Hall, and Allen Prey met with the University of Wisconsin Extension IPM Committee to discuss plans and progress of the Christmas Tree IPM program. An IPM scout will be hired for 1991 by UWEX on a pilot project basis. UWEX will tentatively charge $22.00/acre for the land the grower enters into the program. The properties will be scouted every other week during season. The University of Wisconsin, plant disease clinic will handle the samples collected by the scout and Jane will act as an advisor in sample analysis and diagnosis. The University will be requesting $2,000 from the Christmas Tree Growers Association to pay for root collar weevil identification and for isolation of a common needlecast, ***Cyclaneusma.***

ANNUAL REPORT - 1990

ASH

Ash Yellows - Mycoplasma Like Organism (MLO)

A survey was conducted of 10 white and 10 green ash stands for the presence of ash yellows (Figures 2 and 3). Root samples were analyzed with a DAPI staining technique for the presence of MLOs by a Dr. John Castello, plant virologist at SUNY College of Environmental Science and Forestry, Syracuse, New York.

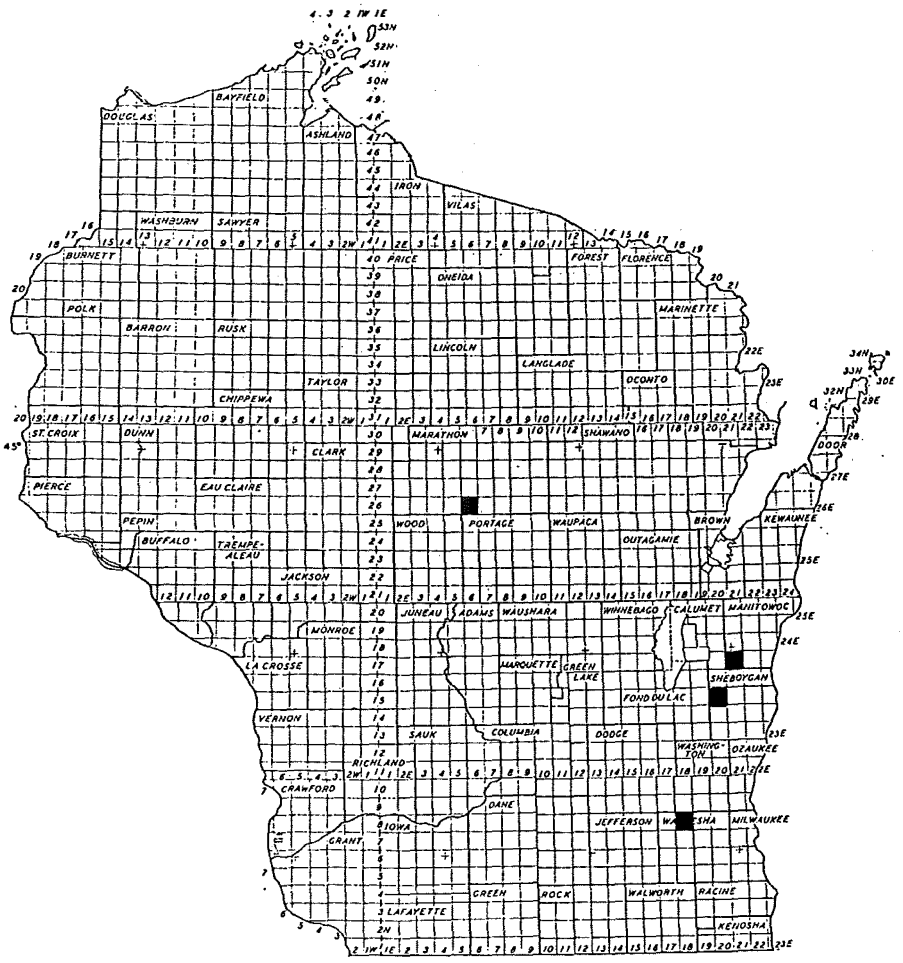


Figure 2. Known township locations of Ash Yellows in Wisconsin-1990.

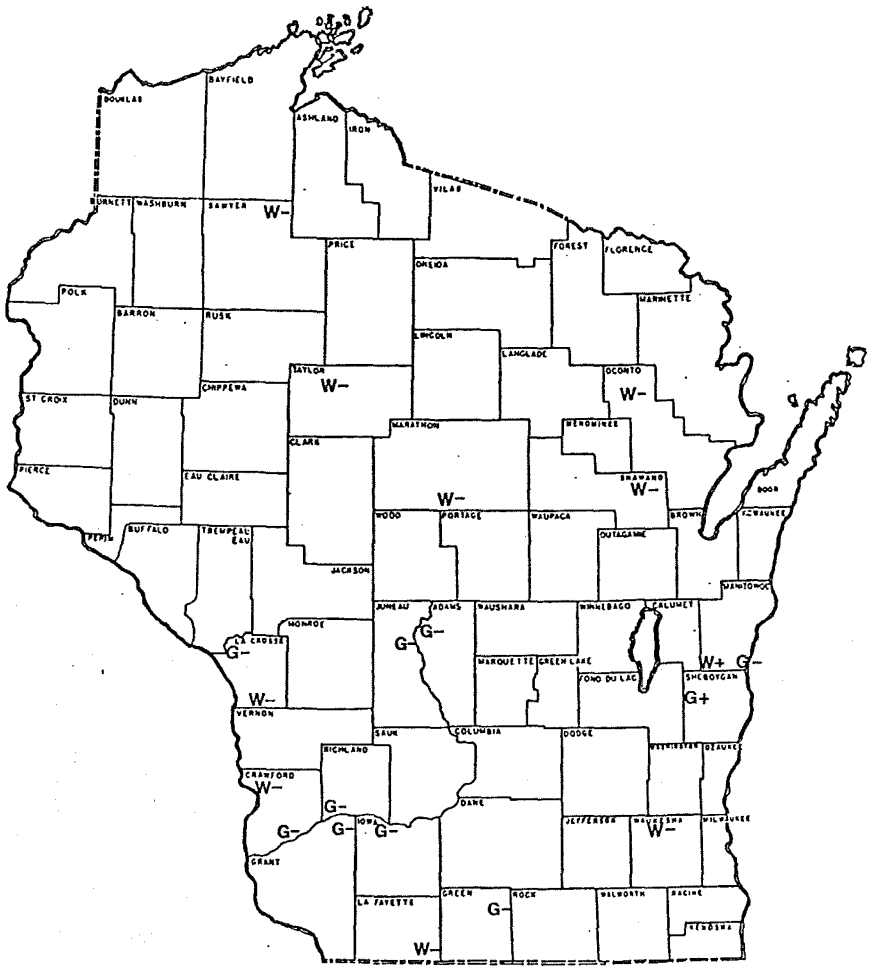


Figure 3. Locations of green and white ash stands surveyed for ash yellows.

W -	=	White ash negative for ash yellow
W +	=	White ash positive for ash yellow
G -	=	Green ash negative for ash yellow
G +	=	Green ash positive for ash yellow

Of the 20 stands, one white ash stand in Manitowoc County, and one green ash stand in Sheboygan County, were positive for MLOs. Anthracnose, *Discula* sp., was observed on 66% of the green and 43% of the white ash surveyed. Approximately 44% of the green ash and 28% of the white ash had <10% of their crowns with any disease symptoms such as dieback, chlorosis, and sparse foliage. Approximately 43% of the green ash and 55% of the white ash had 11-50% of their crowns showing disease symptoms. A paper has been submitted for publication in Plant Disease.

ASPEN

Aspen Bronzing - Unknown

Twig and branch dieback and foliage discoloration were observed on trees in previously identified locations in Washburn County (T40N, R13W, Section 31, SENE; T39N, R12W, Section 17, SWSW; and T40N, R13W, Section 30, SESW). No new counties reported aspen bronzing (Figure 4).

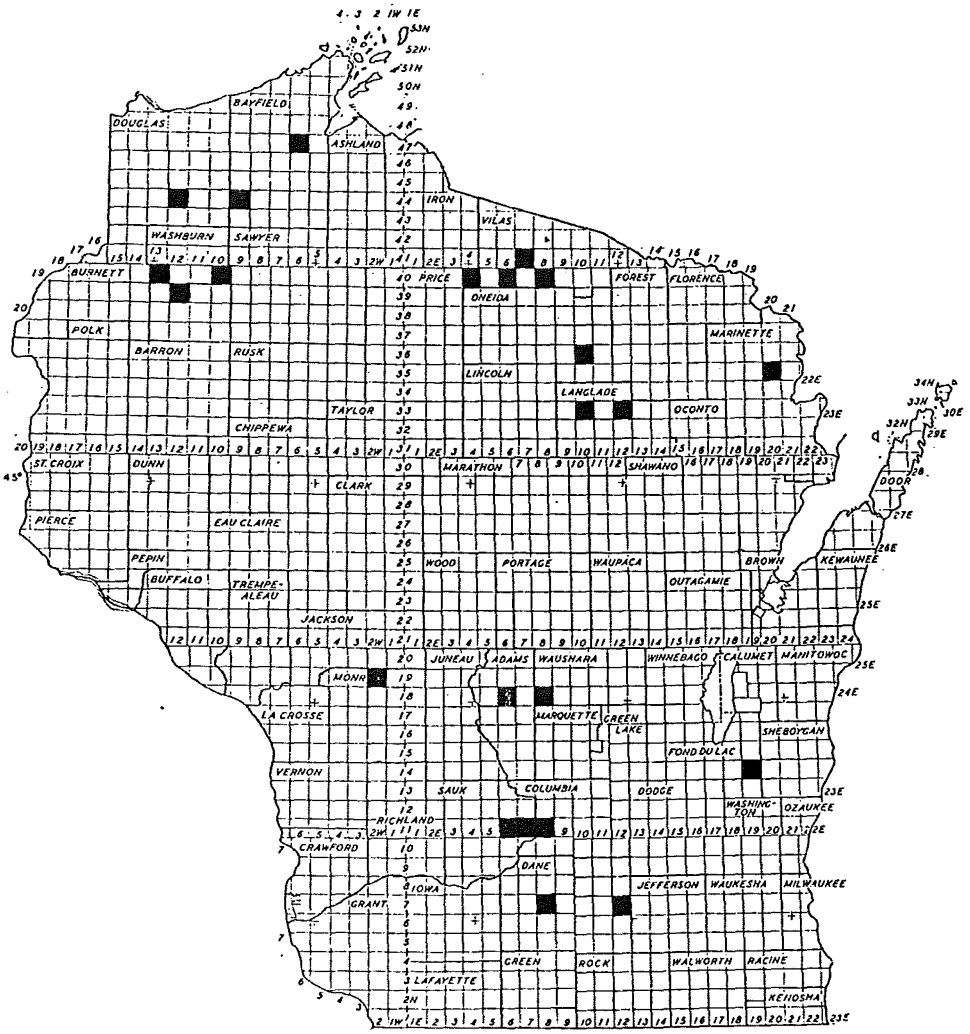


Figure 4. Known township locations of Aspen Bronzing - 1990.

Aspen Blotchminer - *Phyllonorycter tremuloidiella* (Braun)

Populations remained generally low. Light defoliation was observed in Oneida and Vilas counties.

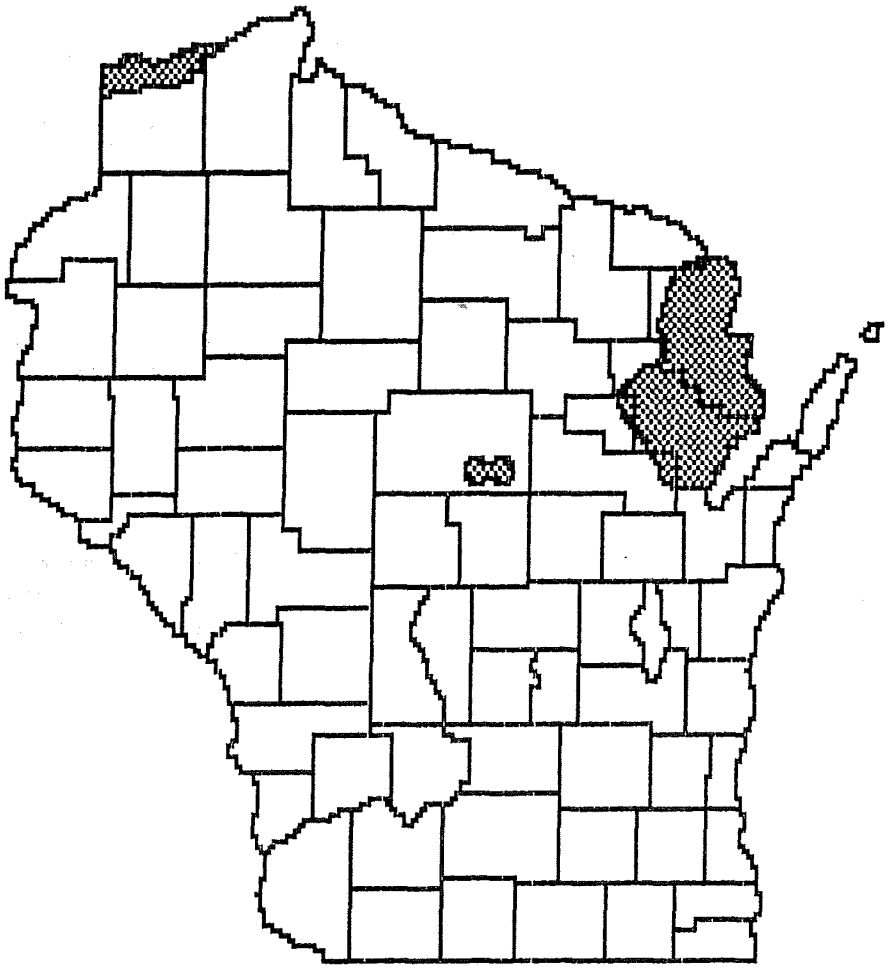


Figure 5. Areas of light to heavy defoliation by the Forest Tent Caterpillar - 1990.

Forest Tent Caterpillar - *Malacosoma disstria* (Hubner)

Widespread heavy defoliation of aspen and oak occurred in Marinette and Oconto counties (Figure 5). Menominee and Shawano counties suffered scattered pockets of light to heavy defoliation. Door County saw the first defoliation of the current outbreak. The parasitic fly, *Sarcophaga aldrichi*, was extremely abundant and caused many complaints by irritated tourists.

In northwestern Wisconsin, the outbreak collapsed except for a narrow strip along the Lake Superior shoreline in Douglas and Bayfield counties where 96,000 acres of aspen was heavily defoliated.

In Menominee County, 17,045 acres of high value red oak was sprayed with diflubenzuron (3 oz. in 1 gallon of water per acre) to prevent defoliation and subsequent attack by the two-lined chestnut borer. The treatment was a success.

Forecast for 1991

The cold rains and snow of early May 1990 did not impact the survival of second and third instar larvae in northeastern Wisconsin. The outbreak persisted and defoliation was heavy in Marathon, Marinette, and Oconto counties, while declining on the Menominee Indian Reservation. The aerial suppression project on the Reservation was a sucess and near total foliage protection was achieved for red oak. The success of the spraying and above normal precipitation during the summer prevented widespread red oak mortality.

The 1990 winter egg mass survey revealed high numbers of egg masses on aspen. The eastern sections of the Menominee Indian Reservation, northwestern Oconto County and most of Marinette County indicates moderate to heavy defoliation could occur in the spring. The scrub oaks and northern red oaks in western Marinette County have already suffered widespread mortality throughout the outbreak area. If the return to normal or above normal precipitation continues in 1991, the trees will survive. The lack of moisture will insure continued stress and the two-lined chestnut borer could cause mortality throughout the region.

In the original counties forming the outbreak region, the forest tent caterpillar populations have collapsed or continues to decline to endemic levels. The exceptions are southeastern Marathon County, Oconto and Marinette counties where the outbreak persists on aspen. The present outbreak has endured longer than any previously recorded for northeastern Wisconsin.

Pattern of the Outbreak since 1986 in Northcentral and Northeastern Wisconsin:

Counties	1986	1987	1988	1989	1990	1991
Florence			X	X		
Vilas		X				X[4]
Oneida				X	X[2]	
Forest		X	X	X	X[2]	
Marinette		X	X	X[1]	X[1]	X[3]
Oconto		X	X[1]	X[1]	X[1]	X[3]
Langlade	X	X	X	X	X[2]	X[4]
Marathon			X[1]	X[1]	X[1]	
Shawano			X	X	X[2]	
Menominee Indian Reservation		X	X	X	X[2]	X[4]

[1] Persistent heavy defoliation in the same area.
[2] Light and declining defoliation throughout the major areas.
[3] Prediction for moderate to heavy defoliation in the same areas.
[4] Prediction for no defoliation to scattered pockets of moderate defoliation.

Phenological Notes:

May 3 Larvae in second instar in Marinette County.
May 4 Larvae in second instar in Menominee County.
May 16 Larvae predominately in second instar in Menominee County and fourth instar in Shawano County.
May 30 Larvae in fourth instar in Langlade and Oneida counties.
June 6 Larvae in fourth and fifth instars in Marinette and Oconto counties.
June 13 Pupation is occurring in Washburn County.
June 20 Pupation is occurring in Marinette and Oconto counties.

Large Aspen Tortrix - *Choristoneura conflictana* (Walker)

Populations erupted in Rusk and Sawyer counties to cause light to moderate defoliation (Figure 6).

Figure 6. Area of light defoliation and a few scattered pockets of moderate defoliation to aspen by the Large Aspen Tortrix.

BASSWOOD

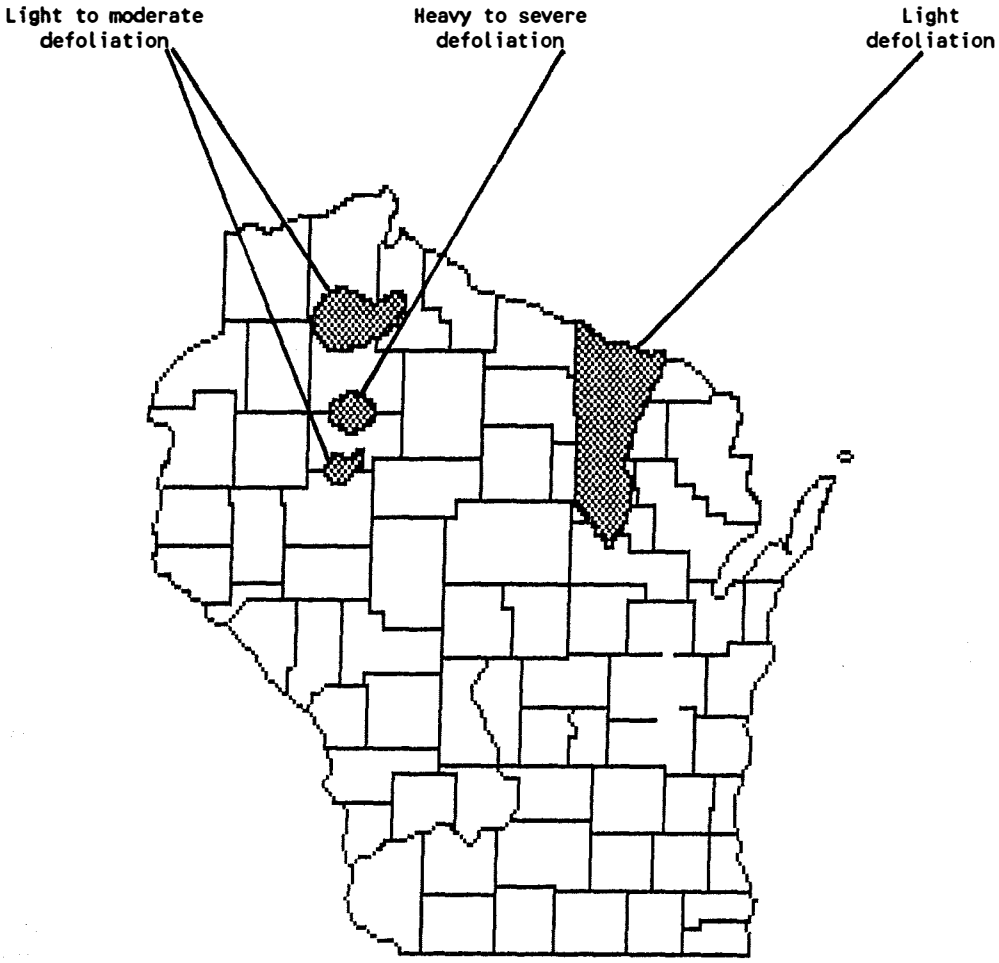


Figure 7. Area of light, moderate, and heavy defoliation by the Basswood Thrips - 1990.

Introduced Basswood Thrips - *Thrips calcaratus* Uzel

Basswood defoliation was generally reduced in 1990. Damage to basswood foliage occurred in scattered pockets of light to severe defoliation in Rusk, Barron, Washburn, Sawyer, Forest, Oneida, Langlade and Menominee counties (Fig. 7). No visible defoliation occurred in the western or southern counties.

BALSAM FIR

Balsam Fir Sawfly - *Neodiprion abietis* (Harris)

Light defoliation was reported in one balsam fir plantation in Langlade County. No significant defoliation was reported in the northwestern counties where damage occurred in 1989.

Spruce Budworm - *Choristoneura fumiferana* (Clemens)

Populations remained very low. For the second straight year, no egg masses were found in surveys in northwestern Wisconsin.

Balsam Gall Midge - *Paradiplosis tumifex* (Gagne)

Populations remained very low. Damage ranged from barely visible in northwestern Wisconsin to scattered, light damage in the northeastern counties.

Balsam Twig Aphid - *Mindarus abietinus* (Koch)

Populations declined in 1990. No damage was reported anywhere in Wisconsin.

Balsam Fir Christmas Trees - browning of the foliage - unknown

Balsam fir Christmas trees in Marinette and Eau Claire counties showed browning and defoliation of 1989 needles, in early 1990. No pathogens were observed. The symptoms were primarily located on the upper portions of the trees and on the south and west sides of the tree. Environmental factors are suspected although winter injury from drying winds and sun was ruled out as the foliage protected by snow was also affected on some trees.

BIRCH

Birch Leafminer - *Fenusa pusilla* (Lepeletier)

Extremely heavy mining of leaves occurred in most of Wisconsin. Generally, the heaviest damage occurred on ornamental and open-grown forest trees. Interior forest trees often suffered heavy leaf mining in many locations in northwestern Wisconsin.

Bronze Birch Borer - *Agrilus anxius* Gory

Birch mortality was at an all time high in northern Wisconsin where, after two years of drought, many birch stands were nearly eliminated. Roughly 40% of commercial white birch volume was dead or dying in the northwestern counties. Mortality was also very high in central and southern Wisconsin, particularly in ornamentals. In north-central counties, mortality ranged from very light to 50% of the birch volume.

Yellow Birch Dieback - Unknown

In northwestern Wisconsin, there appeared to be no progression of dieback of yellow birch.

BUTTERNUT

Butternut Canker - *Sirrococcus clavigignenti - juglandacearum* Nair, Kostichka and Kuntz

The presence of butternut canker was confirmed for Marinette County in 1991 (Figure 8). This is a new county report (T33N, R18E). Butternuts were sampled in Washburn and Saywer counties, but all were negative for butternut canker. The U.S. Forest Service, North Central Forest Experiment Station project continues and Wisconsin is locating and collecting scion wood from disease-free butternuts for grafting. The Forest Service is attempting to establish clonal lines of apparently resistant trees.

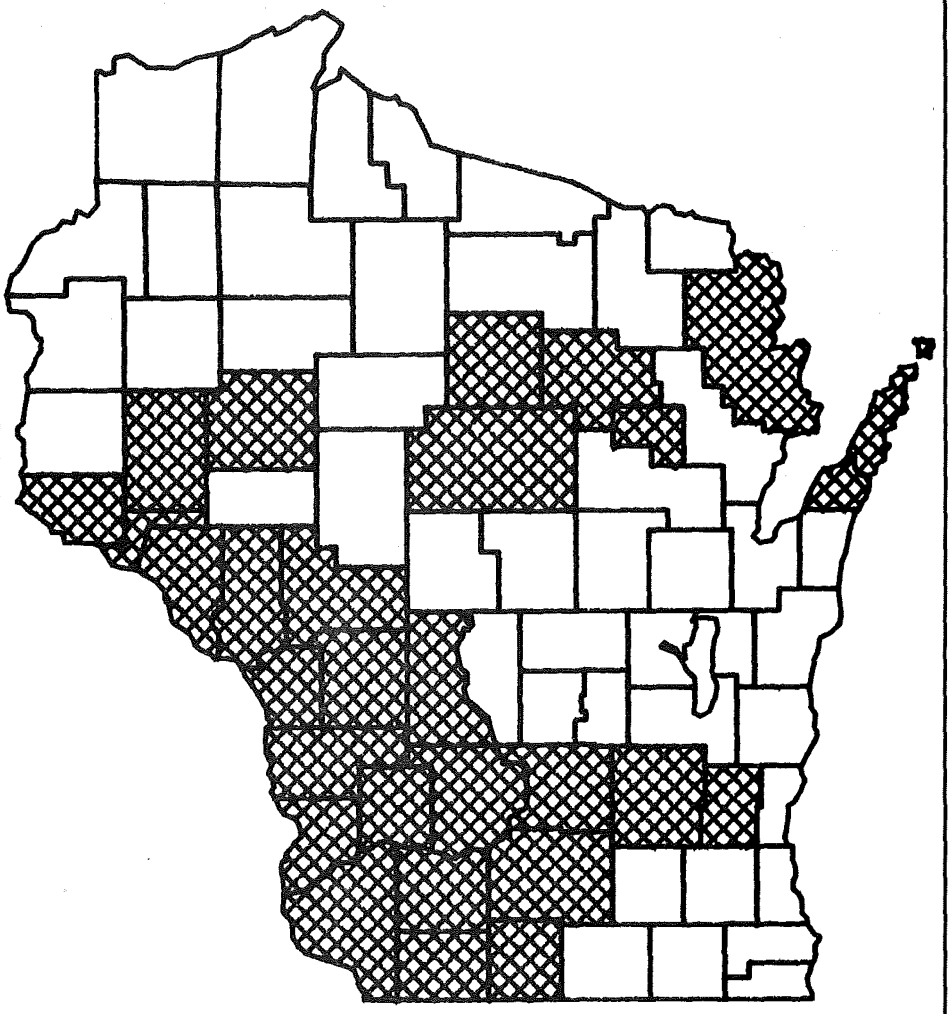


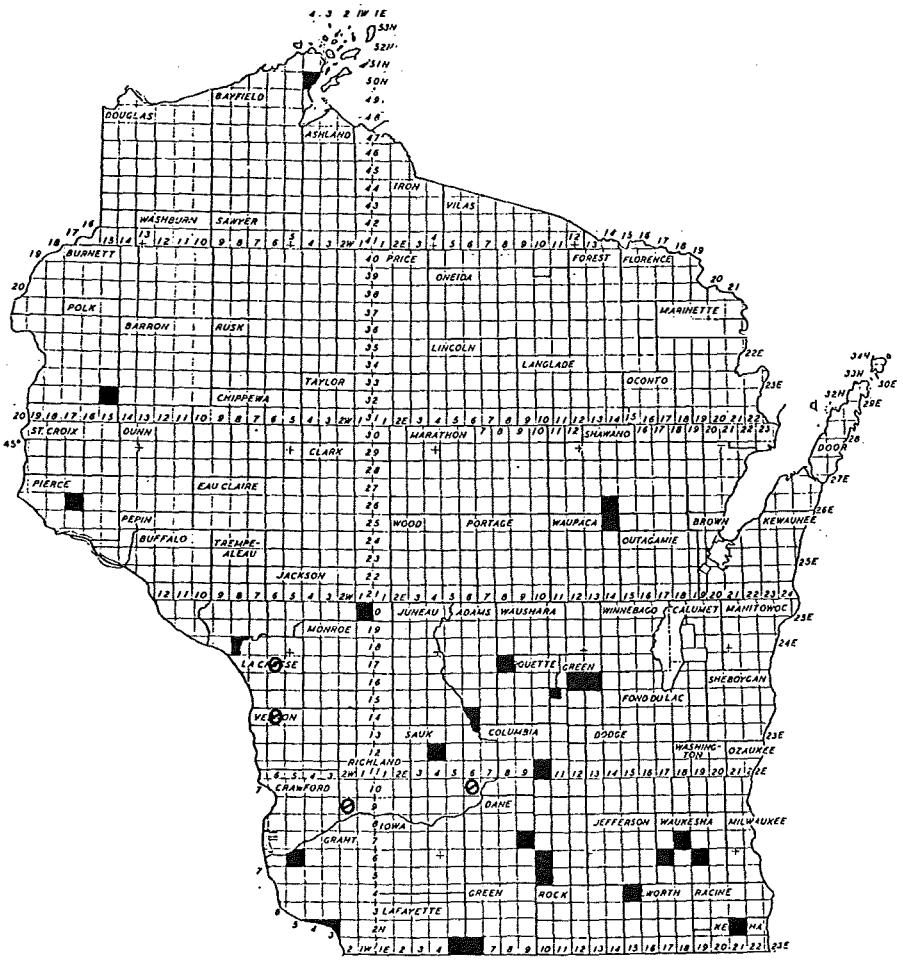
Figure 8. Known county distribution of Butternut Canker - 1990.

CHERRY

Eastern Tent Caterpillar - *Malacosoma americanum* (Fabricius)

Tents were very common in the northwestern counties and in Wood County. In Dane, Rock and Green counties, tents were common but considerably reduced from 1989 levels.

CHESTNUT



Chestnut Locations = ■ Chestnut Blight Locations = ⊘

Figure 9. Township locations of Chestnut and Chestnut Blight - 1990.

Chestnut Blight - *Cryphonectria parasitica* (Murrill) Barr

No new locations of chestnut blight were observed in 1990 (Figure 9).

A survey of a 60-acre American chestnut stand in LaCrosse County was conducted to determine the incidence of chestnut blight. Approximately 2,434 American chestnuts >2 inches in diameter were surveyed. Ten trees were found to be infected with chestnut blight (stroma of the imperfect stage of the fungus *Cryphonectri parasitica* were observed). All infected trees were within 75 yards of the first blighted tree observed in 1987. In September, all the infected trees were located as to distance and azimuth from a reference tree. Samples of stroma were collected from all infected trees in anticipation of introducing hypovirulence in 1991. The hypovirulence introduction will be conducted in cooperation with plant pathologists at Michigan State University, West Virginia University, Cornell University, and Wisconsin DNR.

CHRISTMAS TREES

Cyclaneusma Needlecast - *Cyclaneusma minus* (Butin) DiCosmo, Peredo and Minter

Ten christmas tree plantations in Waushara County were sampled for *Cyclaneusma* needlecast to determine the level of infection in 1989 and 1990 needles. Infection was low in 1989 needles (< 7% of the needles sampled were infected), and was very low in 1990 needles (< 2%). Either infection has been very low the past 2 years, or control sprays with chlorothalonil have been successful. All the fields sampled had been sprayed.

Pales Weevil - *Hylobius pales* (Herbst)

Damage due to adult twig feeding was greatly reduced in southern Wisconsin; few reports of new damage were received.

Diplodia Shoot Blight and Canker - *Sphaeropsis sapinea* (Fr.) Dyke and Sutton

This disease did not appear to cause a problem for growers in 1990.

Cytospora Canker - *Leucostoma kunzei* (Fr.Fr.) Munk

Cytospora canker was commonly observed on balsam fir in areas of the state where the drought was particularly severe such as Marinette County.

Spruce Needlecast - *Lirula macrospora* (Hartig) Darker

This disease was tentatively identified on white spruce Christmas trees in north-central Wisconsin. The samples were collected from a nursery and Christmas tree operation in Langlade County, T31N, R12E, Section 15, by William Kearby. Samples collected during the winter of 1990-91 showed no *L. macrospora*. Samples will be collected during the growing season for confirmation. If this disease is confirmed, it will be the first report of *L. macrospora* in Wisconsin.

Red Pine Shoot Blight - *Sirococcus conigenus* (DC.) P. Cannon and Minter

White spruce in Langlade County, T31N, R12E, Section 15, was infected with red pine shoot blight. Infected trees were located along a red pine wind break, presumably infected with the same disease.

LARCH

Larch Needlecast - *Mycosphaerella laricina* (Hartig) Neg.

Defoliation of a 10-acre plantation of European larch in Polk County (T37N, R15W, Sec. 32) was severe. This plantation has been defoliated by *M. laricina* annually.

Larch Sawfly - *Pristiphora erichsonii* (Hartig)

Defoliation of 10-year-old European and Japanese larch was reported in Forest and Shawano counties whereas nearby eastern larch was not defoliated.

MAPLE

Pear Thrips - *Taeniothrips inconsequens* (Uzel)

A survey revealed this maple pest to be generally distributed in Wisconsin. See Appendix A.

Sugar Maple Decline Surveys - North American Maple Decline Project

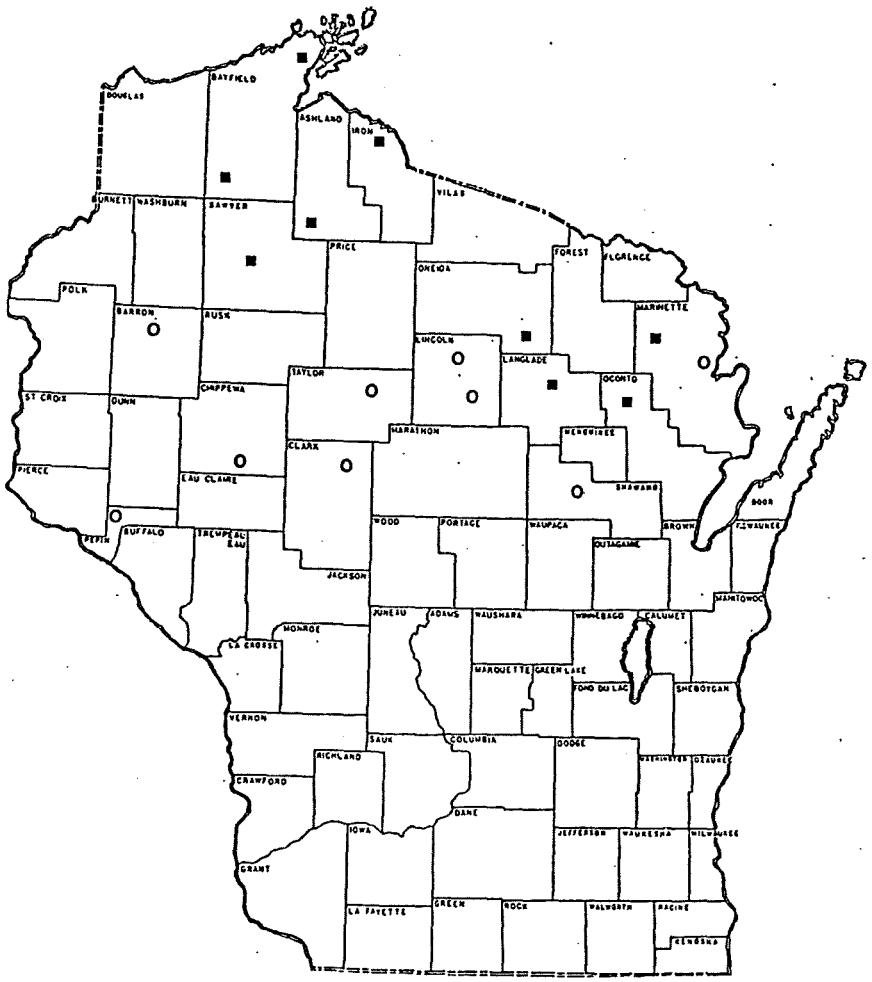


Figure 10. Location of plots in North American Sugar Maple Decline Project.

Undisturbed forest = ■ Sugarbush = O

Wisconsin continued to participate in the North American Sugar Maple Decline Project, administered by the U.S. Forest Service and Canadian Forestry Service. Eighteen plots were estab-lished in Wisconsin in 1988, nine in stands being tapped for maple syrup and nine in forest stands not tapped for maple syrup (Figure 10). Data were collected on the plots in 1988, '89, and '90 to monitor vigor, dieback, discoloration, dwarfing, and crown transparency. Data will be collected in 1991 and a report will follow.

NURSERY

White Pine Seedling Root Rot - *Fusarium oxysporum* Schlecht.

The U.S. Forest Service, North Central Forest Experiment Station, continues to study the epidemiology of this disease at Wilson Nursery, in southwestern Wisconsin. Disease development and its relationship to moisture stress is the primary factor being studied on plots that were established in 1989.

Diplodia Shoot Blight and Canker - *Sphaeropsis sapinea* (Fr.) Dyke and Sutton

At the Wilson State forest tree nursery in southern Wisconsin, a survey was initiated to determine the effects of removing *Diplodia* infected windbreaks on infection rates of seedlings. The survey was conducted on red pine seedlings in their first year of growth. Disease incidence in 10 beds sprayed with Benomyl was compared to disease incidence in 11 unsprayed beds. Disease incidence averaged 2.4% in the unsprayed beds and .6% in the sprayed beds. The survey will continue for another year.

Oak Seedling Mortality - *Cylindrocarpon* sp. and Cold Injury

Approximately 284,000 oak seedlings (1-0 white and red oak and 2-0 white oak) were killed by cold injury and subsequent infection by *Cylindrocarpon sp.* at the Griffith State forest tree nursery, Wood County, Wisconsin. In December, 1989, Wisconsin experienced very cold temperatures (as low as -33°F) and Wood County experienced some of the deepest frost in the state. The frost depths statewide were 10-12" deeper than a 28-year average (1968-1989). This combination of cold, a 3.3" less than average snow depth, and the presence of *Cylindrocarpon* set up perfect conditions for root rot. Approximately 800,000 2-0 red oak (many infected with *Cylindrocarpon*) were left in the beds in hopes of salvaging some of the stock. The infected seedlings were root pruned in July, and much of the infect tap root was cut off.

In October, the root pruned infected stock was examined for new lateral formation and compartmentalization of the rot. A total of 129 seedlings were examined from Sections G and I. Approximately 85% of the seedlings in Section G and 57% in Section I either had no signs of root rot or had compartmentalized the rot. New lateral root production was excellent.

Approximately 400 white and red oak with various stages of root rot were planted at Knapps Creek Wildlife Area, Richland County, in April, 1990. The purpose of the outplanting was to determine the survival potential of infected versus disease-free seedlings. In early September, mortality data were collected and in summary, mortality was high (98%, 54%, 62%) for trees with obvious root rot (sporodochia fruiting on the stem or root discoloration observed without root dissection). Mortality was moderate (40%), for trees with incipient rot (discoloration of the cambium observed upon root dissection). Mortality was moderate to low (5%, 15%, 32%) on seedlings with no signs or symptoms of root rot (Table 1).

Table 1. Number of oak seedlings with various disease symptoms and percent dead after being outplanted for six months at Knapps Creek Wildlife Area, Richland County.[1]

Seedling Description and Nursery that Stock Originated From	Flushed & Healthy	Flushed, Not Healthy	Dead	Dead
	Number of Trees			% Trees
2-0 Ow Wilson - healthy	19	1	1	5
1-0 Ow Hayward - brown cambium	26	3	19	40
1-0 Ow Griffith - severe root rot	0	1	49	98
2-0 Ow Griffith - <25% of tap root rotted	16	7	27	54
1-0 Or Griffith - brown cambium	25	5	20	40
1-0 Or Hayward - healthy	38	7	8	15
1-0 Ow Hayward - healthy	32	2	16	32
2-1 Ow Griffith - >25% of tap root rotted	13	6	31	62

[1] Approximately 50 trees per treatment were planted.

OAK

Oak Wilt - *Ceratocystis fagacearum* (Bretz) Hunt

Oak wilt is present in the southern two-thirds of the state (Figure 11), and continues to kill black and red oak. Oak wilt control programs continued in Menominee and Marinette counties. In western and central Wisconsin, pockets of red oak mortality were frequently observed.

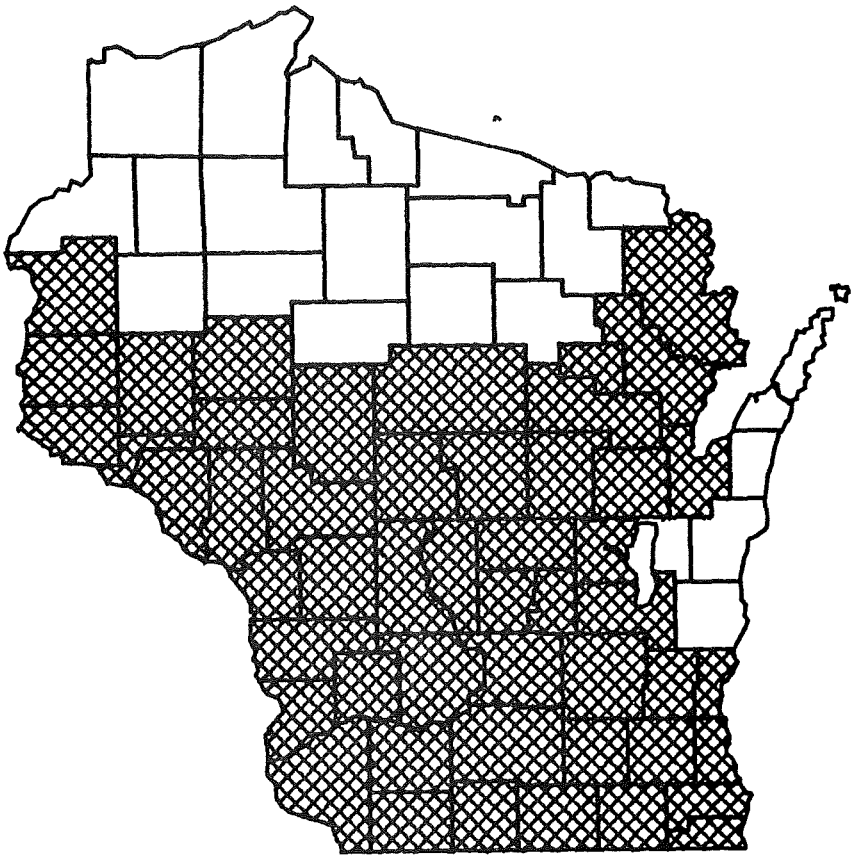


Figure 11. Known county distribution of Oak Wilt - 1990.

In Menominee County, in the Legend Lake area, two oak wilt pockets were observed (one new location and one pocket that is an expansion of a previously reported pocket). The intensive oak wilt control program which includes infected tree removal and trenching to break root grafts between healthy and diseased oaks continues in Menominee County.

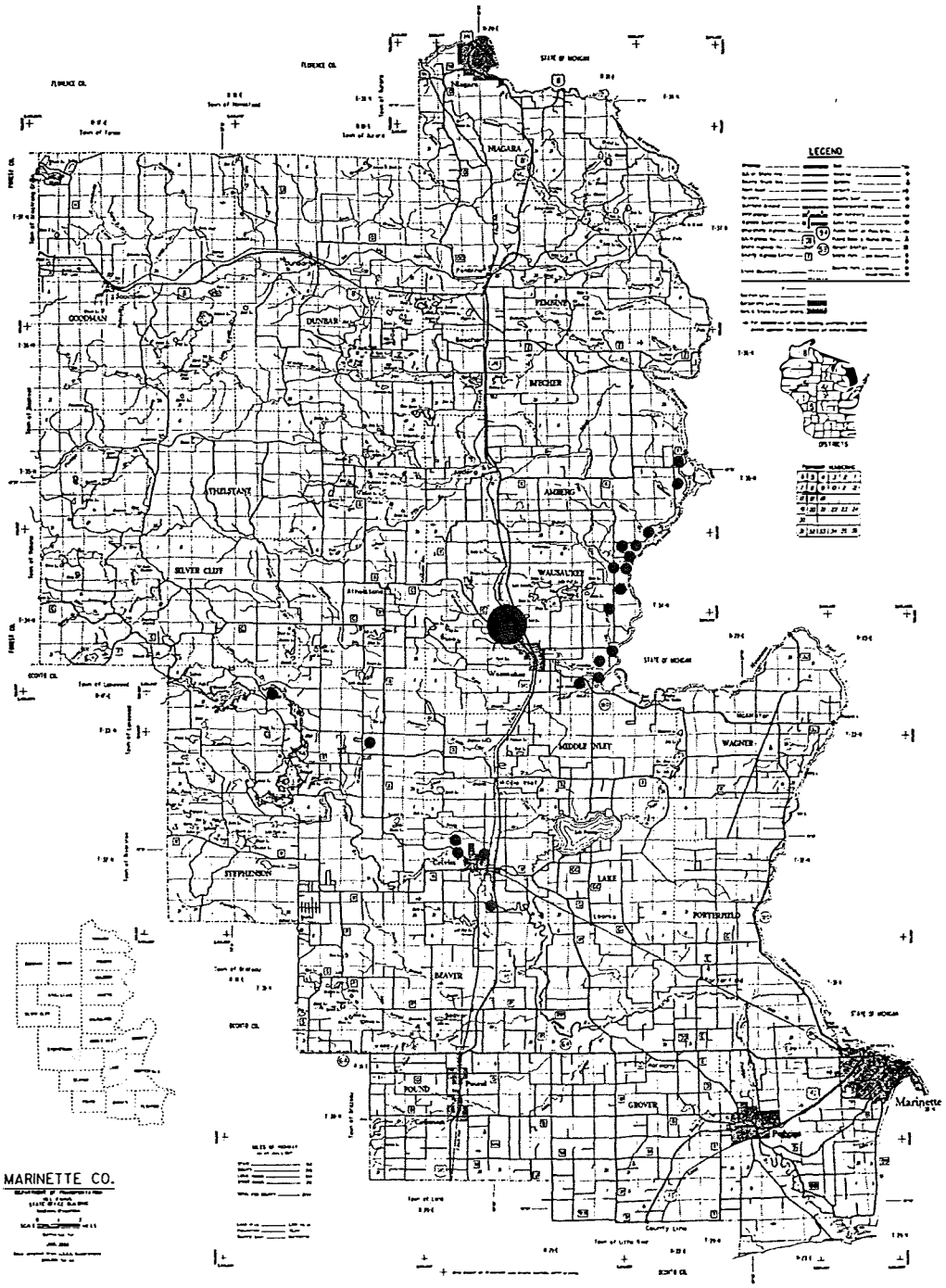


Figure 12. Known locations of oak wilt pockets in Marinette County - 1990. (Large circle = cluster of pockets.)

In Marinette County, one new location of oak wilt was observed approximately 12 miles west of Wausaukee (T3N, R18E, Sec. 11) (Figure 12). Approximately 10 trees were wilting in this pocket.

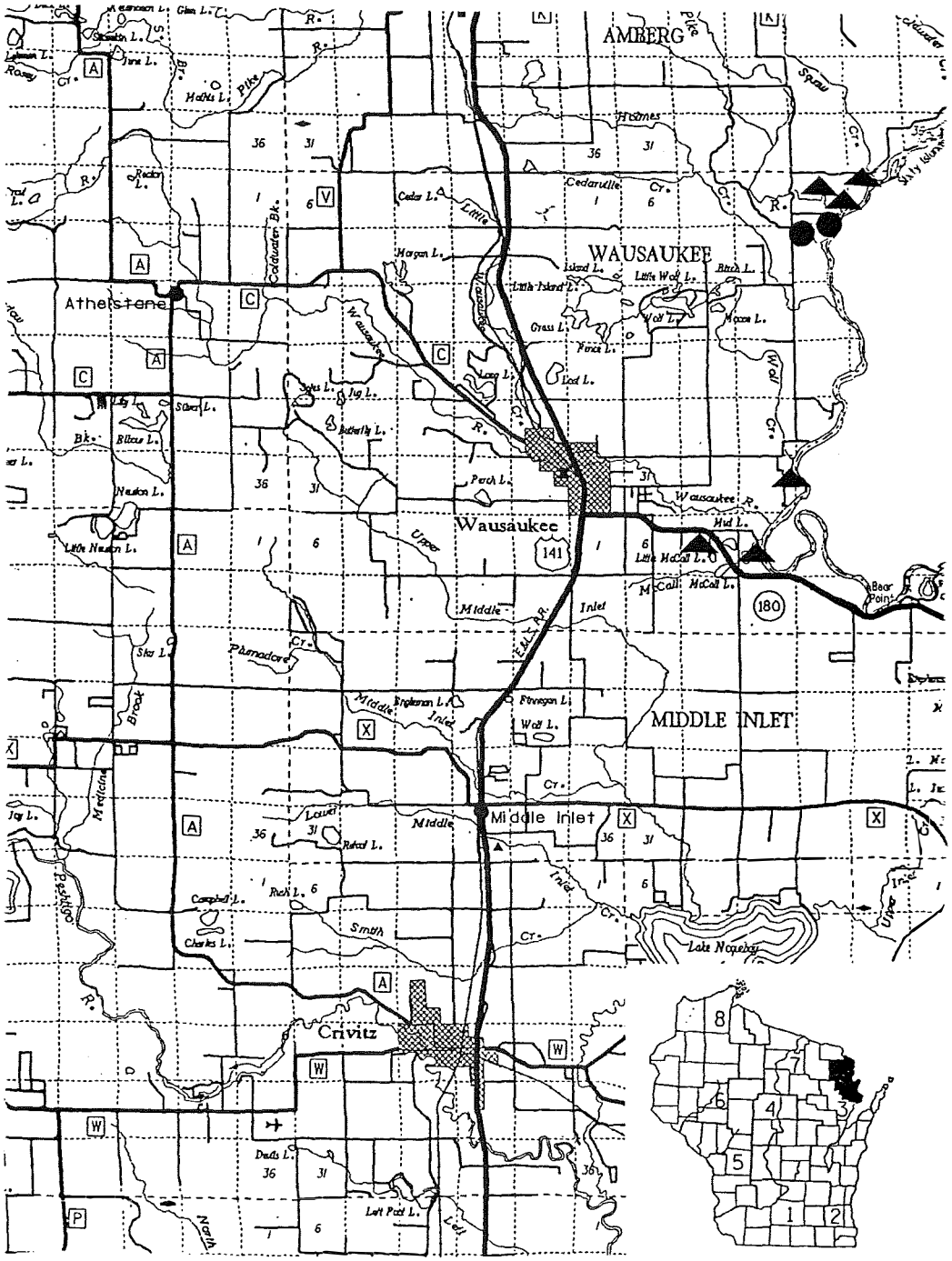


Figure 13. Location of oak wilt pockets trenched in 1989 (O) and 1990 (▲).

In a cooperative effort with the Michigan DNR to control oak wilt along the Menominee River between Marinette County, Wisconsin and Menominee County, Michigan, 6 oak wilt pockets were plowed with a 5' vibratory plow blade (Figure 13). The plowing broke root grafts between infected and healthy trees.

Fall Cankerworm - *Alsophila pometaria* (Harris)

This spring defoliator of oak and other hardwoods had been at outbreak levels since 1985 in Columbia, Sauk and Marquette counties. The outbreak collapsed in 1990 with no defoliation reported.

Saddled Prominent - *Heterocampa guttivitta* (Walker)

An infestation of this late summer defoliator caused light defoliation of red and white oak in Door County.

Twolined Chestnut Borer - *Agrilus bilineatus* (Weber)

Oak mortality increased in northwestern Wisconsin after two years of drought stress made them susceptible to attack by this inner bark borer. Especially hard hit were Polk, Burnett, Washburn, Sawyer, Douglas, Bayfield and St. Croix counties in northwest Wisconsin.

Oak mortality decreased somewhat in the northeastern counties where forest tent caterpillar defoliation decreased; the mortality increased in Marinette and Oconto counties where the defoliation increased and the effects of the drought persisted.

Mortality in the south-central counties decreased dramatically due to the cessation of the fall cankerworm outbreak.

Twig Dieback - *Botryosphaeria quercuum*

Sapling to pole sized, black oak along State Highway 73 and County Highway Z in Wood County (T21N, R5E, Sections 11 and 14), had scattered flagging branches. Upon close observation, small cankers were observed and *Botryosphaeria quercuum* was observed fruiting along the canker margins.

PINE

Diplodia Canker and Shoot Blight - *Sphaeropsis sapinea* (Fr.) Dyke and Sutton

New locations of *Diplodia* were observed in Douglas County Forest (T43N, R10W, Sec. 2) and Washburn County Forest (T40N, R11W, Sec. 30). Disease incidence in previously observed infections in northwest Wisconsin increased slightly.

In Dunn County, western Wisconsin, scattered branch infections were observed on red pine in an area damaged by a hail storm in 1988.

Diplodia shoot blight and canker have been present for several years in Douglas County, northwestern Wisconsin. A 20-acre red pine plantation on county forest land (T43N, R13W, Sec. 31, SWSW) was heavily infected in 1989. A cooperative survey project between the U.S. Forest Service and DNR forest pest management to determine disease incidence and within tree disease development was initiated. In November 1989, approximately 60% of the trees surveyed were diseased. In November 1990, 100 trees were evaluated for disease development. Twelve percent of the trees had no change in the number of infected branches. Eighty-eight percent had some disease development as evidenced by an increase in the number of infected branches or mortality of the tree.

Scleroderris Canker - *Ascocalyx abietina* (Naumov) (Schlaep fer-Bernhard)

No new county locations were reported in 1990 (Figure 14). No major increase in new infections were observed in previously reported counties.

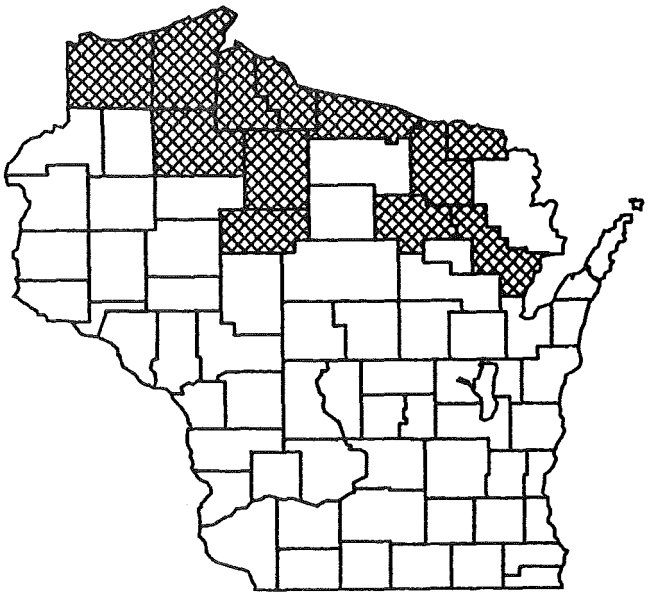


Figure 14. Known county distribution of Scleroderris canker - 1990.

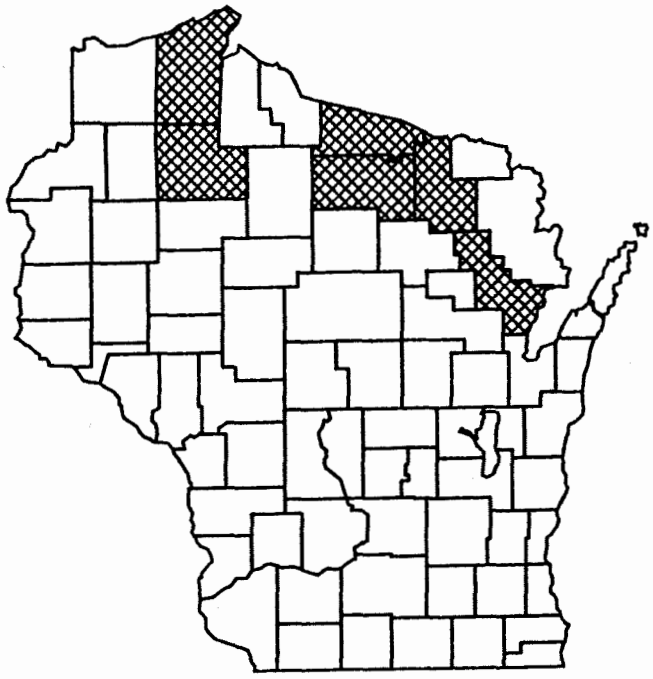


Figure 15. Known county distribution of Sirococcus conigenus - 1990.

Red Pine Shoot Blight - *Sirococcus conigenus* (DC.) P. Cannon and Minter

No new county locations were reported in 1990 (Figure 15). See Christmas tree report for *S. conigenus* on white spruce.

Jack Pine Budworm - *Choristoneura pinus* (Rohwer)

Populations continue at low levels in northern Wisconsin. A slight increase in larval numbers was observed in Polk County but no defoliation was observed.

European Pine Sawfly - *Neodiprion sertifer* (Geoffroy)

Heavy spring defoliation of red and scotch pine occurred in the south-central counties. Many sapling sized trees' old needles were completely defoliated. This exotic species was first reported in Wisconsin in 1970. It was reported in LaCrosse, Monroe and Eau Claire counties for the first time.

Redheaded Pine Sawfly - *Neodiprion lecontei* (Fitch)

Isolated small jack pines were heavily defoliated in scattered locations in Washburn and Burnett counties. No defoliation in valuable trees was observed.

Red Pine Needle Midge - *Thecodiplosis piniresinosae* Kearby

About 15,000 acres of pole sized red pine in central Burnett County was lightly defoliated.

Red Pine Shoot Moth - *Dioryctria resinosella* Mutuura

Damage to red pine shoots increased to very high levels in the well known hazard zone in the central, southern and southwestern counties. Damage was also noticeable in northeastern and northwestern counties where little damage is expected even in outbreak years.

Large numbers of adults caught in pheromone traps in west-central and southern Wisconsin indicate a potential for a very heavy population in 1991. Pheromone trapping is covered in more detail in the seed orchard section.

Saratoga Spittlebug - *Aphrophora saratogensis* (Fitch)

Populations remained very low throughout Wisconsin; no damaging populations were observed or reported.

Pine Tortoise Scale - *Toumeyella parvicornis* (Cockerell)

Populations in the central counties declined to very low levels in 1990. No reports of significant damage were received.

Pine Root Collar Weevil - *Hylobius radicis* (Buchanan)

Damage to Scotch pine trees remained at very low levels.

Pine Root Tip Weevil - *Hylobius rhizophagus* Millers, Benjamin and Warner

Damage to red pine remained at very low levels. No reports of damage were received.

White Pine Weevil - *Pissodes strobi* (Peck)

Tip damage to white pine declined to normal levels so that only scattered, light damage was observed.

Pine Engraver - *Ips pini* (Say)

Pine mortality was relatively low during this summer with normal and above normal rainfall. A few weakened pole-sized red pines were killed in scattered locations but no serious damage was reported.

White Grubs - *Phyllophaga* sp.

Damage to young conifer plantations declined so that no reports of root feeding were received.

Plains Pocket Gopher - *Geomys bursarius*

Damage to sapling red pine plantations declined to moderate levels in Douglas and Burnett counties after rather high levels of damage in 1989.

Meadow Vole - *Microtus pennsylvanicus*

Losses in new conifer plantations due to bark feeding during the winter declined so that no reports of damage new were received.

SPRUCE

Spruce Needle Rust: *Chrysomyxa* sp.

Scattered ornamental blue and white spruce in Langlade, Oneida, and Shawano counties were infected with spruce needle rust. Infection caused defoliation of current years needles. The alternate hosts were labrador tea and leather leaf. No controls were recommended.

Yellowheaded Spruce Sawfly: *Pikonema alaskensis* (Rohwer)

This summer spruce defoliator continued to threaten young white spruce plantations in northern Wisconsin. Several privately owned plantations (approximately 2 acres) in Washburn County (Town of Sarona, T37N, R12W, Sec. 9) were sprayed to prevent serious damage. Malathion was used. A heavy population was observed in a Vilas County plantation.

BLACK WALNUT

Plantation Black Walnut Canker - *Fusarium sporotrichioides* Sherb.

Walnut canker associated with *F. solani* was observed for the first time in a natural stand (Iowa County, T6N, R4E, Section 17). This disease has been reported in plantation grown black walnut throughout the natural range of walnut in southern Wisconsin. The natural stand is approximately 15 acres and the cankered tree was 10 years old.

MISCELLANEOUS SPECIES

Gypsy Moth - *Lymantria dispar* (L.)

A general, very light infestation is known to exist from Sturgeon Bay in Door County to the city of Manitowoc in Manitowoc County based on trap catches, burlap banding and egg mass surveys. Trap catches suggest that the infestation may extend to Oconto and Marinette counties but intensive surveys failed to turn up egg masses in these counties. DNR cooperated with Wisconsin Department of Agriculture, Trade and Consumer Protection (WDATCP), U.S. Department of Agriculture and University of Wisconsin - Extension in a program to eradicate the infestation.

Nine locations in Door and Kewaunee counties totaling 530 acres were sprayed three times with the bacterial insecticide, *Bacillus thuringiensis*. The numbers of adult males trapped in the treated areas were greatly reduced from 1989 levels and no egg masses were found.Two other locations where egg masses were found in 1989 were treated with intensive trapping.

Five thousand adults of the parasitic wasp, *Cotesia melanoscelus* were released on June 1, 1990 at a single location near Algoma (T24N, R25E, Sec 3, SESW) in Kewaunee County. The release was monitored by weekly inspections of burlap bands on 25 trees. No gypsy moth larvae and no parasite cocoons were found under the burlap.

Trap catches of adult males nearly tripled, increasing from 5,616 in 1989 to 16,642 this year (see table). The largest increases were in the counties bordering Lake Michigan and Green Bay.

Larvae, pupae and adult females were found under burlap bands along the lake shore in Door, Kewaunee and Manitowoc counties. Egg mass surveys turned up 207 egg masses in Door, Kewaunee and Manitowoc counties.

The following table of adult male trap catches is a summary provided by WDATCP and is up-to-date as of December 6, 1990.

County	Adult Males	County	Adult Males
Ashland	1	Milwaukee	370
Brown	656	Oconto	323
Calumet	71	Outagamie	66
Dane	23	Ozaukee	538
Dodge	50	Polk	1
Door	4,015	Portage	1
Florence	1	Racine	91
Fond du Lac	72	Rock	20
Forest	2	Sheboygan	1,524
Jefferson	8	St. Croix	2
Kewaunee	3,119	Walworth	11
Kenosha	63	Washington	344
Langlade	1	Waukesha	336
Manitowoc	3,102	Waupaca	9
Marinette	643	Winnebago	175
Menominee	3	Wood	1
		State Total	15,642

Periodical Cicada - *Magicada septendecim* (L.)

Adult cicadas returned after spending 17 years in the soil in southern Wisconsin. Isolated pockets occurred in Crawford, Richland, Grant, Iowa, Dane, Rock and Walworth counties. Some of the pockets contained low numbers that caused little twig damage; others were very heavy. Oviposition wounds in a Rock County infestation caused heavy twig damage to a young black walnut plantation.

Following are specific locations of observed cicada sightings or damage in 1990 compiled from reports by Department of Natural Resources, Department of Agriculture, Trade and Consumer Protection and University of Wisconsin - Extension personnel (Figure 16):

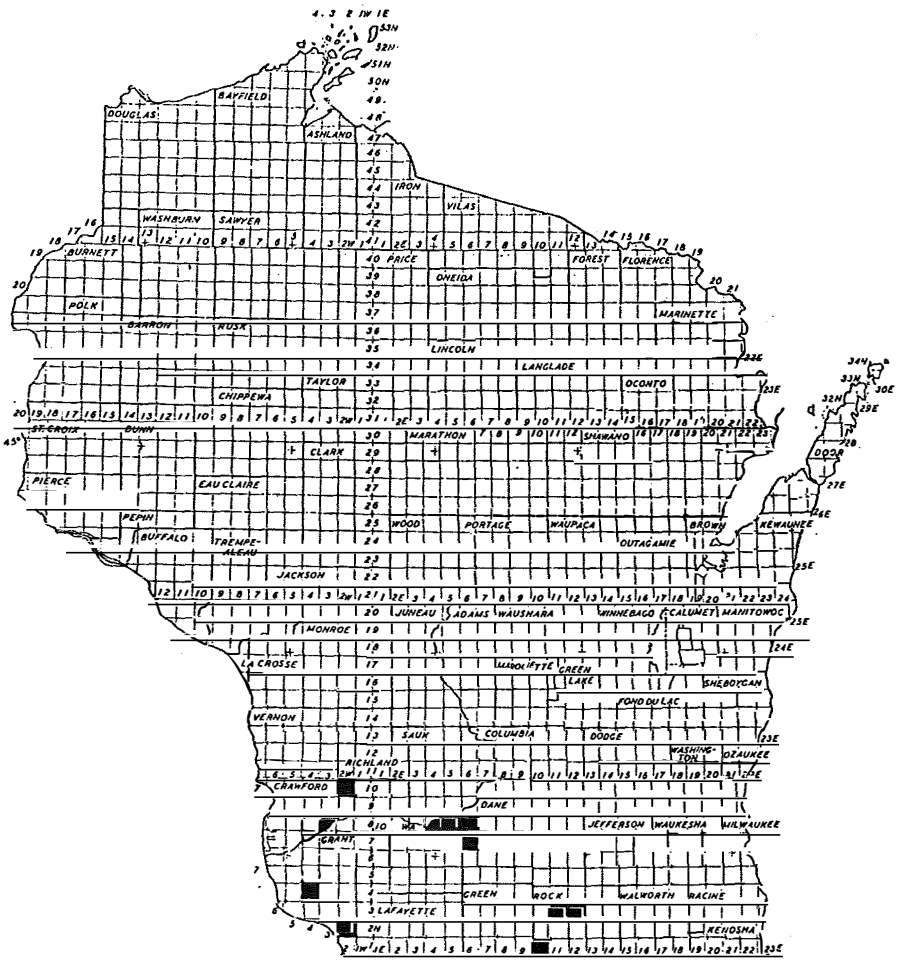


Figure 16. Locations of cicada sightings or damage - 1990.

Crawford County -

T8N, R3W, Section 1, NW¼. One mile from SR 60 on Badger Road. Oak woodlot on NE side or road.

Grant County -

T2N, R2W, Section 16, SW¼. About 1 mile NW of Dickeyville on U.S. Highway 61 on NE side of road.

T4N, R4W, NW¼ of Section 23 and NE¼ of Section 22. At Junction of Porter Bridge and Porter Hill Roads in oak woodlot to the south.

Richland County -

T10N, R2W, Section 27, at junction of Munz Hollow and Hells Hollow Roads. In block of young apple trees in commercial apple orchard.

Iowa County -

June 26. T8N, R4E, Section 34, along entire length of Coon Rock Road in Section 34. Singing heard. No damage observed.

June 26, July 2. T8N, R4E, Section 27, 28. Along Tower Hill Road (Golf Course Road). Singing, many adults observed, some oviposition damage.

June 26. T8N, R5E, Section 29, SE¼; Section 31, S½, NE¼; Section 32, NE¼, NW¼. Mostly south of Mellon Road. Singing heard. No oviposition damage observed.

Dane County -

July 9. T7N, R6E, Section 18, NWSW. Heavy on poplar, oak, cherry and elm.

June 26. T8N, R6E, SW¼ of Section 29 and SE¼ of Section 30. At intersection of Reeve Road and Fesenfeld Road. Infestation is from 1 mile west of intersection to ¼ mile east.

Rock County -

June 26. T1N, R10E, Section 16, NWNW. Adults very heavy on oak, and elm edge trees and dogwood brush. Cast skins in gobs on underbrush. Very heavy oviposition damage in young walnut plantation surrounded by oak woodlot. Took many photos.

June 28. Janesville. T3N, R12E. Along east bank of Rock River just north of town. Singing heard.

T3N, R11E, Section 12, NE¼. About 3/4 to 1 mile north of U.S. 14 on SR 184 in oak woodlot on both sides of road.

Weather

A spring snowstorm dumped up to eight inches of very wet, heavy snow over eastern Wisconsin. The snow combined with winds gusting to 35 mph to damage or destroy thousands of trees and down numerous power lines. Many residences, businesses, and vehicles were damaged by the falling trees. Total damage estimates were over $4 million, including $1.5 million in Washington County, and $1 million each in both Waukesha and Milwaukee counties. Schools and businesses were closed, mail delivery was canceled, and numerous accidents occurred. Wisconsin Electric estimated over 30,000 customers were without power, some for up to two days. A 71-year-old woman was injured when a tree fell on her. In the city of Waukesha, 80% of the 30,000 trees were damaged or destroyed. Snow amounts included eight inches in Muskego (Waukesha County) and Hartford (Washington County).

APPENDIX A

David J. Hall

SEED ORCHARD IPM DEVELOPMENT PROGRAM

DNR, Forest Pest Managment Unit continued cooperation with U. S. Forest Service, State & Private Forestry and the Forest Pest Management Institute of Forestry Canada to develop methods to manage red pine seed and cone pests.

An electronic temperature recorder was placed in the seed orchard at the red pine seed orchard at Avoca in order to relate accumulated heat units to insect activity and plant development.

Several pheromone trapping evaluations were conducted to identify the sex pheromone of the red pine shoot moth, *Dioryctria resinosella* Muttuura. Other tests were conducted to confirm the sex pheromones of the webbing coneworm, *Dioryctria disclusa* Heinrich, and the red pine cone borer, *Eucosma monitorana* Heinrich, and to relate the flight period of the Eastern pine seedworm, *Cydia toreuta* (Grote), to accumulated heat units. The results of this work will be published in an appropriate journal.

Insecticide evaluations of two products were conducted in the red pine seed orchard at Avoca. Two tree-drench applications of acephate and esfenvalerate were attempted on May 7 and May 18. Weather conditions during the entire application period were rainy and windy. Attempts to make the applications were ended prematurely several times due to windy conditions. We were never able to achieve adequate coverage of the tops of the crowns where the majority of the cones are. The insecticide applications were unsuccessful.

APPENDIX B

Lake States Pear Thrips and Introduced Basswood Thrips Survey:
Project Summary

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James E. Werlein &
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Wisconsin Department of Natural Resources
March 4, 1991

The Pear Thrips, Taeniothrips inconsequens has caused heavy defoliation to maples in the eastern states. It was found in southwestern Wisconsin in 1989. Prior to 1990 it had not been found in Minnesota, Iowa, Illinois or the Upper Peninsula of Michigan although its presence was suspected.

The Introduced Basswood Thrips, Thrips calceratus, has defoliated basswood in Michigan, Minnesota and Wisconsin for more than ten years. Prior to 1990 it had not been found in Iowa, Illinois, southeastern Wisconsin or southeastern Minnesota although its presence was expected.

The objective of this project was to determine the distribution of the pear thrips and introduced basswood thrips in Wisconsin and document the presence of these species in the surrounding states.

Field Survey Methods

Both species of thrips overwinter as adults in the soil. Emergence in the spring takes place as the buds of the host trees open. Introduced basswood thrips are often found feeding on the succulent tissue inside bud scales very shortly after the scales have parted. Pear thrips are often found in the sugar maple flowers before the foliage buds have opened and later on the young developing foliage.

Sample Collection

Bud samples were collected twice from each plot at two-week or three-week intervals. The first was collected in mid May; the second was collected shortly before full leaf expansion in late May to late June.

Buds were collected within arms reach from the ground where possible. Within each plot, three expanding buds were collected from each of five trees and placed in 80% ethanol.

In northern Wisconsin, sugar maples in sugar bushes that had previously been examined for symptoms of decline were sampled for pear thrips. Eleven plots were selected in the southern half of Wisconsin. Three locations from each surrounding state were sampled. Some were collected by Wisconsin DNR personnel; some were collected by local personnel and mailed.

During field sampling an occasional "non host" tree species was sampled.

Laboratory Methods

The three authors were trained to identify both species of thrips as well as the native basswood thrips by Dr. Ken Raffa, University of Wisconsin, Department of Entomology. The first author developed a handout to aid in the identification of the three thrip species (attached).

Bud samples were examined for adult pear thrips and introduced basswood thrips. The presence of both species was recorded.

Results and Discussion

Table 2 and Figures 17 and 18 summarize the results.

Pear thrips were found scattered widely in Wisconsin and in neighboring areas of Iowa and the Upper Peninsula. The presence of pear thrips in a plot was usually revealed by a single specimen; the population levels were extremely low on the foliage. Absence of pear thrips in a sample, therefore, does not necessarily negate the presence in the general area of the plot. Because of the widely scattered distribution revealed by the map, we believe that pear thrips is present throughout Wisconsin and much of Michigan, Minnesota, Iowa and Northern Illinois.

The introduced basswood thrips is also widely distributed in Wisconsin and surrounding states. Some samples contained hundreds of specimens. It was found in many of the basswoods sampled as well as on ash, aspen, ironwood, hickory and birch.

Table 2. Basswood and pear thrips survey locations and status for Illinois, Iowa, Michigan, Minnesota, Missouri and Wisconsin.

STATE	COUNTY	LEGAL DESCR.	HOST SPECIES*		
			Sugar Maple	Basswood	Other^
Illinois	Jo Daviess	T28N R4E S4	BT		
Illinois	Lake	T45N R9E S28		BT	
Illinois	Winnebago	T45N R2E S27	BT	BT	BT,Irn
Iowa	Allamakee	T96N R3W S27		BT,PT	
Iowa	Clayton	T91N R2W S11	PT	BT	BT,BHic
Iowa	Dubuque	T89N R2E S5 NW NW	PT	BT	BT,Ash
Iowa	Jackson	T86N R4E S13			
Michigan	Gogebic	T44N R46W S11			
Michigan	Iron	T42N R37W S11	PT	BT	
Michigan	Ontonagon	T45N R39W S34	PT	BT,PT	
Minnesota	Carlton	T48N R16W S24		BT	
Minnesota	Carlton	T49N R18W S16		BT	
Minnesota	St. Louis	T50N R19W S2		BT	
Minnesota	Winona	O.L. Kipp State Park		BT	
Missouri	Boone	?			
Missouri	Boone	?			
Missouri	Boone	?			
Missouri	Pulaski	?			
Missouri	Pulaski	?			
Wisconsin	Ashland	T41N R3W S3	BT		
Wisconsin	Ashland	T41N R4W S15 NE SW		BT	
Wisconsin	Barron	T35N R13W S13			
Wisconsin	Bayfield	T43N R8W S11 SE SW		BT	
Wisconsin	Bayfield	T43N R9W S4	BT		
Wisconsin	Bayfield	T45N R7W S34 NW NE		BT,PT	
Wisconsin	Bayfield	T50N R4W S10 SW SW	BT	BT	
Wisconsin	Bayfield	T56N R4W S9	PT		
Wisconsin	Burnett	T37N R14W S3 NW NW			
Wisconsin	Chippewa	T29N R6W S19 NW NE	BT	BT	
Wisconsin	Chippewa	T32N R7W S?		PT	
Wisconsin	Clark	T28N R1W S2 NE SW	BT	BT	
Wisconsin	Clark	T28N R6W S2			
Wisconsin	Dane	T7N R9E S28		BT	
Wisconsin	Dodge	T13N R17E S33			
Wisconsin	Dodge	T9N R15E S36	BT,PT		
Wisconsin	Door	T28N R27E S2 SE NE	PT		
Wisconsin	Door	T30N R27E S30 SE SW			BT,Brch
Wisconsin	Door	T31N R27E S15		BT	
Wisconsin	Douglas	T45N R14W S19 NE&SENW	BT	BT	
Wisconsin	Florence	T39N R17E S5 NW SE	PT		
Wisconsin	Forest	T40N R13E S2 NW NW			
Wisconsin	Grant	T7N R4W S31	BT,PT		BT,BHic
Wisconsin	Green	T3N R9E S31	PT	BT	
Wisconsin	Iowa	T6N R2E S13		BT	
Wisconsin	Iowa	T8N R2E S8 NW SW			BT,Ch,Irn
Wisconsin	Iron	T46N R1E S15		BT	
Wisconsin	Jefferson	T6N R16E S15	BT,PT		BT,Irn
Wisconsin	Juneau	T14N R3E S32 SW SW		BT	
Wisconsin	Juneau	T20N R3E S12 SW SW			

Wisconsin	Langlade	T32N R11E S24 NE SW	PT		BT,Brch
Wisconsin	Langlade	T33N R12E S28 SE SE	BT,PT		BT,Irn
Wisconsin	Lincoln	T32N R8E S32 NW NE	BT,PT	BT	
Wisconsin	Lincoln	T34N R6E S25 NW SW	PT	BT	
Wisconsin	Manitowoc	T21N R22E S13 SW SE	BT,PT	BT	BT,Bch,Ch
Wisconsin	Marathon	T28N R7E S9 NW SW	BT,PT	BT	BT,Ash
Wisconsin	Marinette	T35N R17E S14 NW NW			
Wisconsin	Marinette	T35N R21E S27			
Wisconsin	Monroe	T16N R2W S14 NW NW		BT	
Wisconsin	Oconto	T32N R16E S25 NE SW	BT		
Wisconsin	Oneida	T35N R10E S31 SE NW	BT		
Wisconsin	Pepin	T25N R14W S17	BT		
Wisconsin	Polk	T37N R15W S35 SE NW			
Wisconsin	Price	T39N R2W S29 NE NE			
Wisconsin	Richland	T11N R1E S17			
Wisconsin	Rusk	T35N R9W S24 NE&SW NW	BT	BT	
Wisconsin	Rusk	T36N R6W S3 SW SW	BT	BT	
Wisconsin	Rusk	T36N R8W S20 NW NE		BT	
Wisconsin	Sauk	T9N R5E S23			
Wisconsin	Sawyer	T39N R7W S16	BT,PT		PT,Ash
Wisconsin	Sawyer	T41N R8W S28 SE SW		BT	
Wisconsin	Shawano	T27N R13E S14 SE NW	PT		BT,Ash
Wisconsin	Shawano	T29N R11E S4			
Wisconsin	Taylor	T33N R1E S25			
Wisconsin	Vilas	T41N R6E S36 NE SW			BT,As
Wisconsin	Washburn	T37N R10W S21 SE&SWSE	BT	BT	
Wisconsin	Washington	T10N R18E S24	PT	BT	BT,Ch
Wisconsin	Waukesha	T5N R17E S29		BT	
Wisconsin	Wood	T22N R2E S12 NW NW			

* BT= basswood thrips present, PT= pear thrips present

^ Other species abbreviations: Ash=Ash, As=Aspen, Bch=Beech, BHic=Bitternut Hickory, Brch=Birch, Ch=Cherry, Irn=Ironwood

Note: All sites listed were collected from, some of which had no occurrences of thrips.

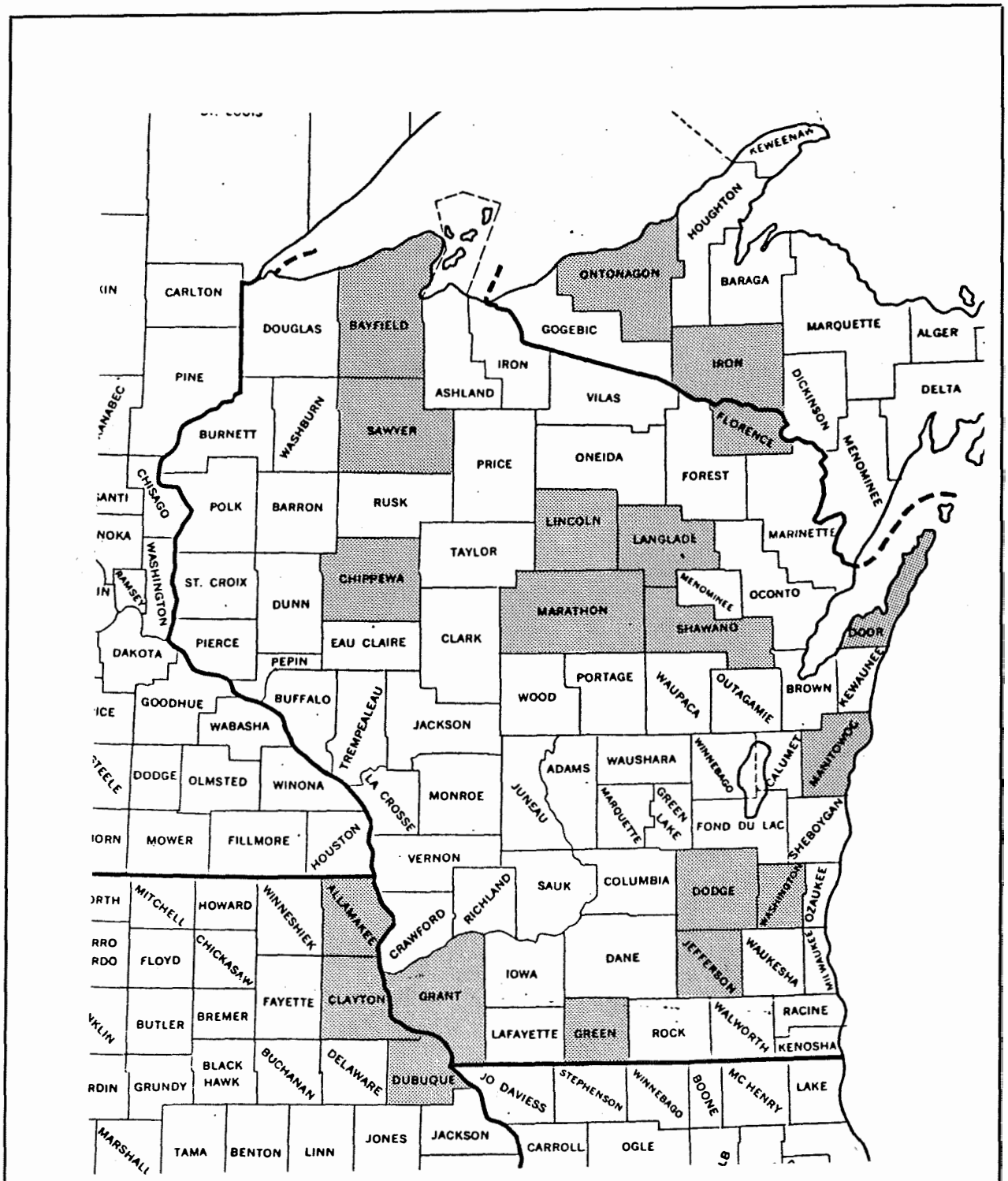


Figure 17. Known locations of Pear Thrips - 1990.

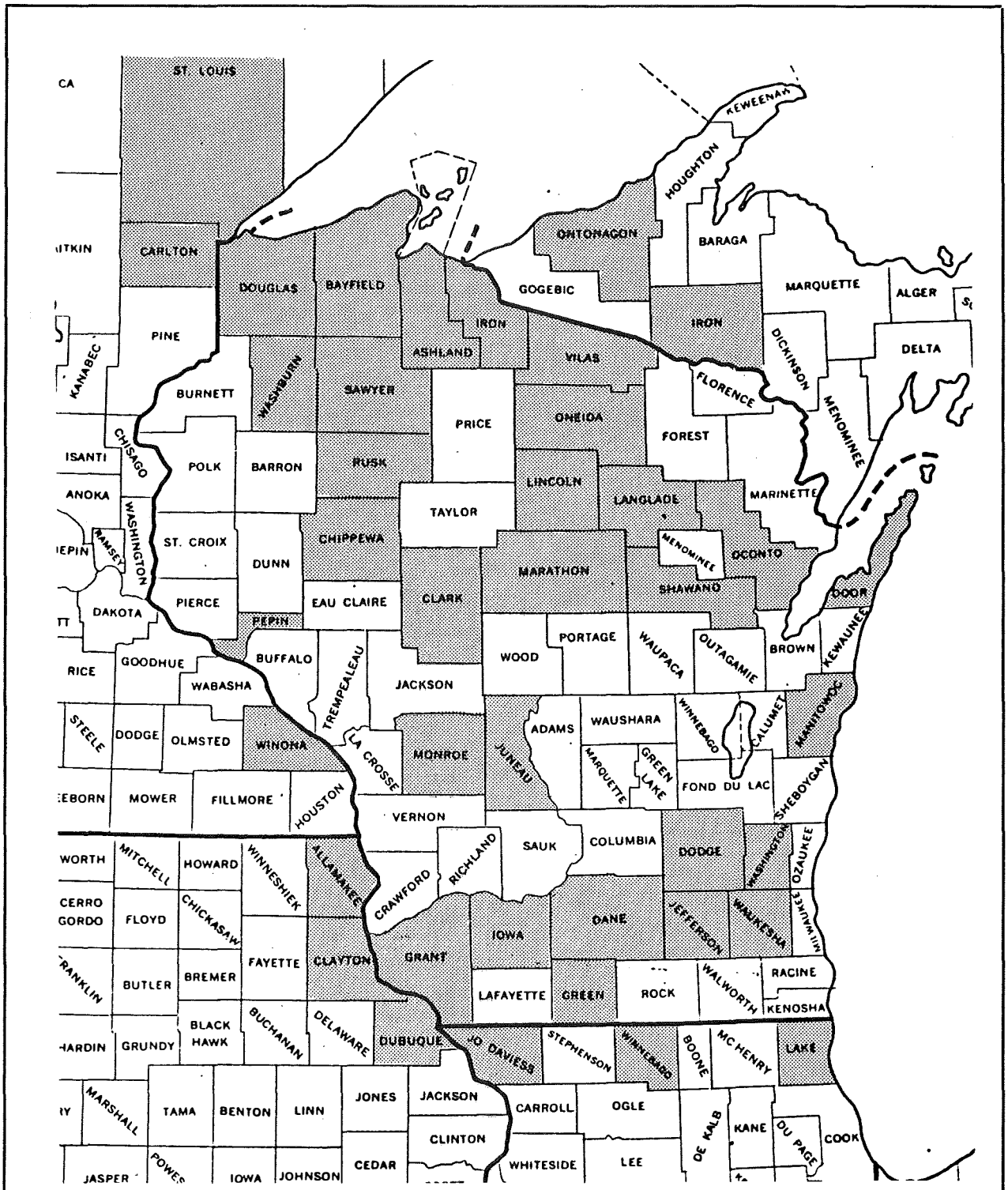


Figure 18. Known locations of Basswood Thrips - 1990.

DISTINGUISHING CHARACTERISTICS OF PEAR THRIPS,
INTRODUCED BASSWOOD THRIPS, AND NATIVE BASSWOOD THRIPS.

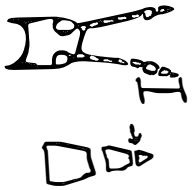
By Mark A. Guthmiller, Wisconsin DNR, Forest Pest Management

September 1990

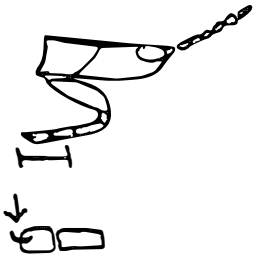
Pear Thrips, *Taeniothrips inconsequens*

Adult (winged)

ANTENNA STRUCTURE
Segment distal to swollen sixth segment has an extra suture. Eight total segments.

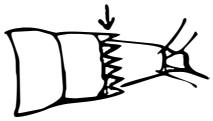


FORE TARSAL CLAW
Fore tarsal claw projecting at apex.



Larva (wingless)*

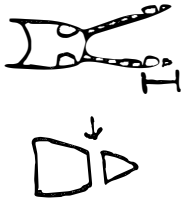
COMB STRUCTURE
Comb structure, posterior to eighth abdominal segment, has 7-8 large tooth-like projections. Six can be counted from dorsal view.



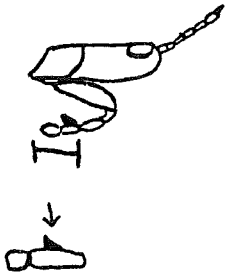
Introduced Basswood Thrips, *Thrips calceratus*

Adult (winged)

ANTENNA STRUCTURE
Segment distal to swollen sixth segment has no suture. Seven total segments.

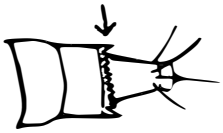


FORE TARSAL CLAW
Fore tarsal claw projecting before apex.



Larva (wingless)*

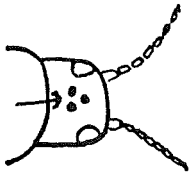
COMB STRUCTURE
Comb structure, posterior to eighth abdominal segment, has 17-18 small tooth-like projections. Twelve can be counted from dorsal view.



Native Basswood Thrips, *Sericothrips tiliae*

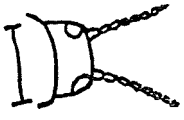
Adult (winged)

Identified from above species by white-colored body with wings and three red ocelli between eyes.



Larva (wingless)

Identified from above species by wide head. Head is wider than long.



*Early instars of larva cannot be identified.